NUCLEAR SCIENCE ABSTRACTS

Volume 9 May 15, 1955 No. 9

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ERRATA

NSA Vol. 5, No. 19, p.817. In abstract 5266, Jones, J. should be Lones, J.

NSA Vol. 7, No. 19, p.654. In abstract 5357, line 2, Ti 130A should be Ti-150A.

NSA Vol. 7, No. 19, p.655. In abstract 5365, F. G. Gillig should be F. J. Gillig.

NSA Vol. 8, No. 20, p.743. In abstract 6164, Meyer, H. E. should be Meyer, H. M.

NUCLEAR SCIENCE ABSTRACTS

Volume 9 May 15, 1955 No. 9

GENERAL

ATOMIC POWER

3003

A BIBLIOGRAPHY OF ATOMIC POWER AND RELATED ATOMIC ENERGY TOPICS FOR THE NON-SPECIALIST. Chalk River, Ontario Canada, Atomic Energy of Canada Limited, May, 1954. 87p.

BIOLOGY AND MEDICINE

3004 BNL-305

Brookhaven National Lab.

THE THYROID. REPORT OF SYMPOSIUM HELD JUNE 9 TO 11, 1954. BROOKHAVEN SYMPOSIA IN BIOLOGY NO. 7. 278p.

Topics discussed at this conference include phylogenetic and developmental aspects of the thyroid, pituitary regulation of thyroid gland function, the iodine-concentrating mechanism of the thyroid gland, the site and rate of formation of thyroid hormone, mechanism of action of antithyroid compounds, the circulating thyroid hormone, effect of thyroid hormones on enzyme systems the distribution of radioactive thyroid hormone, conjugation and excretion of the hormone, the interrelation of the thyroid and the adrenals, spontaneous hyperplasia and neoplasia of the thyroid of animals, experimental thyroid tumors, I^{131} concentration and thyroid morphology, and the relation of thyroidal activity and radiation to growth of hypophysical tumors. Author and subject indexes are included. 907 references. (C.H.)

3005 UCLA-327

Atomic Energy Project, Univ. of Calif., Los Angeles

EFFECT OF CHLORPROMAZINE ON CARDIAC ARRHYTHMIAS INDUCED BY INTRA-CEREBRAL INJECTION OF TRYPTAMINE-STROPHANTHIDIN. S. J. Weinberg and Thomas J. Haley. Mar. 18, 1955. 20p. Contract AT-04-1-GEN-12.

3006

BREAKAGE OF CHROMOSOMES IN TRADESCANTIA WITH A CALCIUM DEFICIENCY. Dale Steffensen (Brookhaven National Lab., Upton, N. Y.). Proc. Natl. Acad. Sci. U. S. 41, 155-60(1955) Mar.

Tradescantia plants from the same clone were grown in different calcium concentrations. Observations from microspores and pollen showed that plants grown in suboptimal calcium concentrations exhibited at least seventeen times more chromosomal aberrations and micronuclei than did plants grown in optimal calcium. Coupling these data with the biochemical evidence presented, it was concluded that bivalent cations may bind together the macromolecular constituents of the chromosome and thereby provide structural stability. (auth)

RADIATION EFFECTS

3007 LA-1849

Los Alamos Scientific Lab.

RELATION BETWEEN SPECIFIC IONIZATION OF VARIOUS RADIATIONS AND THEIR RELATIVE BIOLOGICAL EFFECTIVENESS IN MAMMALIAN SYSTEMS. John Furchner. Sept. 1954. 101p. Contract W-7405-Eng-36.

The relative biological effectiveness of several radiations of differing specific ionizations was determined. The radiation effect studied was impairment of bone marrow function, and the biological test system used was the depression of Fe^{59} uptake by the red blood cells of male Sprague-Dawley rats. The effectiveness of the mixed radiations in the thermal column of a homogeneous reactor was compared with 250-kvp x radiation, and the effect of the beta particles of tritium was compared with that of Co^{60} gamma rays. The effect of the alpha particles of Pu and Ra on bone marrow function was also determined. Results are summarized. 121 references. (auth)

3008 NP-5565

Naval Medical Research Inst., Bethesda

EFFECTS OF DRUGS AND RADIATION: SIMILARITIES AND DIFFERENCES AND THEIR SIGNIFICANCE FOR RESEARCH AND TEACHING. (LECTURE AND REVIEW SERIES NO. 54-5). Friedrich Ellinger. Oct. 22, 1954. 4p.

3009 UCRL-2857

Radiation Lab., Univ. of Calif., Berkeley

X-IRRADIATION AND LIPOPROTEIN METABOLISM IN VARIOUS SPECIES. John E. Hewitt and Thomas L. Hayes. Jan. 31, 1955. 27p. Contract W-7405-eng-48.

Changes in lipoprotein concentrations following x irradiation have been studied in the rabbit, dog, rat, and mouse. At the radiation doses employed, the alterations in serum lipoprotein concentrations occurred at a different time for each species. Hyperlipoproteinemia is associated with higher average flotation rates for the lipoprotein molecules, indicating qualitative as well as quantitative changes in the metabolism of lipids in the irradiated animal. A relatively large increase in the concentration of the low density lipoproteins precedes death from irradiation in the rabbit, rat, and dog. (auth)

3010 UR-379

Atomic Energy Project, Univ. of Rochester

A SURVEY OF THE LITERATURE ON THE BIOLOGICAL EFFECTS OF RADON AND A DETERMINATION OF ITS ACUTE TOXICITY. Doanld A. Morken. Jan. 24, 1955. 101p. Contract W-7401-eng-49.

Mice of CAF_1 strain were exposed to high concentrations of radon in a specially constructed inhalation system designed to provide a high degree of control over the radon atmosphere. The concentration of radon was about 2.2×10^{-4} curie per liter; the atmosphere was essentially free of the decay products of radon. The 30-day LD-50 is obtained by an exposure for one hour to a concentration between 5.7 and 8.8 millicuries per liter. Autopsy revealed a generalized radiation damage throughout the body. Changes in cellular composition of the blood were not as pronounced as in equivalent exposures to x irradiation. The physiological effects expected and previously reported in the literature were observed in these mice. A fairly complete survey and critique of the radon literature, with respect to the acute toxicity of radon, is included. (auth)

3011

UPTAKE OF RADIOACTIVE IRON (^{59}Fe) BY NUCLEATED RED CELLS IN VITRO. L. G. Lajtha and H. D. Suit (Churchill Hospital, Oxford, England). Brit. J. Haematol. 1, 55-61(1955) Jan.

The uptake of Fe^{59} by human bone-marrow cells in vitro is described. The uptake is restricted to nucleated red cells and reticulocytes. The rate of uptake is maximal in the late pronormoblast and basophilic normoblast stage; it decreases in the polychromatic normoblast stage. Some of the late polychromatic normoblasts and orthochromatic normoblasts show no uptake. No difference in the Fe^{59} uptake was observed between normoblasts and megaloblasts. X irradiation in vitro does not inhibit the Fe^{59} uptake by the cells, but it produces a relative shift to the right in the cellular composition of the cultures by destroying more early forms than late forms. (auth)

3012

THE EFFECT OF A SINGLE DOSE OF X-RAYS ON THE PERIPHERAL BLOOD COUNT OF MAN. W. M. Court Brown and John D. Abbatt (Postgraduate Medical School of London, England). Brit. J. Haematol. 1, 75-85(1955) Jan.

Data are summarized on changes in the peripheral blood count of a group of patients suffering from ankylosing spondylitis and treated with a single x-ray exposure to the sacroiliac joints and the whole length of the spine. The average dose received in the bone marrow of the spinal column in the patients was calculated to be from 135 to 285 r. (C.H.)

3013

A COMPARISON OF THE EFFECTS OF RADIATION AND RADIOMIMETIC CHEMICALS ON THE BLOOD. L. A. Elson (Chester Beatty Research Inst., London, England). Brit. J. Haematol. 1, 104-16(1955) Jan.

The effects of whole-body x irradiation on the body weight and on the blood picture of rats are compared with the same effects produced by Myleran, 1:4-dimethanesulphonyloxybutane, and by the nitrogen mustard derivative, NN-di(2-chloroethyl)-p-aminophenylbutyric acid. (C.H.)

3014

RADIATION EFFECTS IN PARAMECIUM. E. L. Powers (Argonne National Lab., Lemont, Ill.). Ann. N. Y. Acad. Sci. 59, 619-37(1955) Feb.

The effects of x radiation on death of cells, death after autogamy, and suppression of fission in Paramecium are reviewed. (C.H.)

3015

FACTORS IN THE RADIOSENSITIVITY OF MAMMALIAN CELLS. Harvey M. Patt (Argonne National Lab., Lemont, Ill.). Ann. N. Y. Acad. Sci. 59, 649-64(1955) Feb.

There is no obvious common denominator to account for differences in radiosensitivity of the various mammalian cells and tissues. Although these differences can be related in certain instances to mitosis and growth, there are a number of exceptions to this condition. The over-all relationships are complex and are influenced by the interplay in the system as a whole. The killing of lymphocytes appears to be mainly a direct consequence of their radiosensitivity. Sensitivity in vivo and in vitro is remarkably similar when extenuating factors are considered. The influence of environmental factors on sensitivity of lymphoid and other tissues is discussed. The idea that radiation effects may be mediated by chemical vectors seems firmly established. Many of the protective effects of hypoxia and substances such as cysteine can be interpreted in terms of chemical intermediates derived from water and their reactions. It is clear, however, that we can not confine our thinking in this area. 51 references. (auth)

3016

THE BIOLOGICAL EFFECT OF FAST ELECTRONS AND EXTRA-HARD X-RAYS FROM THE 15 MEV ELECTRON SYNCHROTRON IN COMPARISON TO X RAYS OF USUAL HARDNESS. H. Gärtner. Strahlentherapie 96, 201-27(1955) Feb. (In German)

The author investigated the influence of high-energy rays from a 15-Mev betatron and that of x rays of ordinary hardness on the growth of tissue cultures with a view to determining the difference in the biological action of these two radiations. In the first part of the paper the experimental setup is described as well as the method of evaluation, and results obtained with x rays of ordinary hardness are reported. (auth)

3017

THE PROBLEM OF RADIATION RESISTANCE IN BIOLOGY AND MEDICINE. G. Schubert. Strahlentherapie 96, 271-3 (1955) Feb. (In German)

The author reports on the theoretical and experimental fundamentals of the radioresistance developed by malignant tumors. (auth)

3018

THE RELATIONSHIP OF X-RAY DOSE TO THE TIME OF DEVELOPMENT OF RADIATION SICKNESS FOLLOWING EXPOSURE TO A SINGLE DOSE OF X RAYS. W. M. Court Brown and John D. Abbatt (Post-graduate Medical School of London). Brit. J. Radiol. 28, 153-8(1955) Mar.

The influence of body size and x-ray dose have been discussed in relationship to the time of development of symptoms following a single x-ray exposure to either the whole length of the spine or the pelvis. Evidence has been brought forward to indicate that the total-body integral dose cannot be correlated with the severity of radiation sickness. It is suggested that certainly as regards radiation sickness the expression of dose ought to be qualified by the level of dose received in specified organs and tissues of known radiosensitivity. (auth)

3019

ACUTE LEUKAEMIA FOLLOWING X-RAY AND RADIOIODINE TREATMENT OF THYROID CARCINOMA. P. S. Blom, A. Querido, and C. H. W. Leeksma (Univ. of Leiden, Holland). Brit. J. Radiol. 28, 165-6(1955) Mar.

The case history is presented of a woman suffering from thyroid carcinoma with cerebral and pulmonary metastases, who, after x-ray therapy, developed aplastic anemia which ended fatally in acute leukemia. (auth)

3020

RELATIVE EFFECTS OF QUALITATIVELY DIFFERENT IONIZING RADIATIONS ON THE PRODUCTION OF CHROMATID ABERRATIONS IN AIR AND IN NITROGEN. C. P. Swanson (John Hopkins Univ., Baltimore, Md. and Oak Ridge

National Lab., Tenn.). Genetics 40, 193-203(1955) Mar.

Results are presented from a comparative study of frequencies, in air and in nitrogen, of chromatid aberrations in Tradescantia caused by 50-, 100-, and 250-kvp x rays, as well as by Co^{60} γ radiation. (C.H.)

3021

A COMPARATIVE STUDY OF INDUCED MUTATION IN THE OOCYTES AND SPERMATOZOA OF DROSOPHILA MELANOGASTER. I. TRANSLOCATIONS AND INVERSIONS. Bentley Glass (Johns Hopkins Univ., Baltimore). Genetics 40, 252-67(1955) Mar.

3022

THE EFFECT OF OXYGEN AND OF HYDROGEN PEROXIDE ON THE ACTION OF A SPECIFIC GENE AND ON TUMOR INDUCTION IN DROSOPHILA MELANOGASTER. Henry L. Plaine (Johns Hopkins Univ., Baltimore). Genetics 40, 268-80(1955) Mar.

When Drosophila embryos of the suppressor-erupt strain are treated with solutions of hydrogen peroxide, there is a significantly increased incidence of melanotic tumors in the 3rd instar larvae and an increased frequency of erupt eyes in the adult flies. When the embryos are exposed for ten minutes to concentrations of 0% O_2, 10% O_2, air, 60% O_2, and 100% O_2, without being x-rayed, the strain shows a small but significantly increased incidence of tumors with increasing oxygen tension. The same treatment applied to 10-hr-old embryos of a wild-type strain gives similar results, but a lower levels of incidence. The frequency of erupt is not affected by so short an exposure to O_2, but exposures of suppressor-erupt embryos to pure oxygen for one hour significantly increases the frequency of erupt. The radiogenic effect may therefore be regarded as an enhancement of the effect of oxygen tension alone. The results obtained when embryos are exposed to solutions of hydrogen peroxide or to pure oxygen without irradiation, together with those obtained when embryos are irradiated in different concentrations of oxygen, suggest that x-rays may produce both melanotic tumors and erupt eyes by the production from oxygen of certain potent oxidizing agents analogous to and including hydrogen peroxide. (auth)

3023

A COMPARATIVE STUDY OF INDUCED MUTATION IN THE OOCYTES AND SPERMATOZOA OF DROSOPHILA MELANOGASTER. II. DEFICIENCIES AND MINUTES. Bentley Glass (Johns Hopkins Univ., Baltimore). Genetics 40, 281-96(1955) Mar.

3024

FEULGEN-NEGATIVE NUCLEAR DIVISION IN HABROBRACON EGGS AFTER LETHAL EXPOSURE TO X-RAYS OR NITROGEN MUSTARD. R. C. von Borstel (Oak Ridge National Lab., Tenn.). Nature 175, 342-3(1955) Feb. 19.

Female Habrobracon were treated with a lethal dose of x radiation or an equivalent dose of nitrogen mustard. The developmental pattern of eggs which were in metaphase-I during the time of treatment is described and possible mechanisms of action of the mutagens are discussed. (C.H.)

3025

NATIONAL SURVEY OF CONGENITAL MALFORMATIONS RESULTING FROM EXPOSURE TO ROENTGEN RADIATION Stanley H. Macht (Washington County Hospital, Hagerstown, Md.) and Philip S. Lawrence (U. S. Public Health Service, Hagerstown, Md.). Am. J. Roentgenol. Radium Therapy Nuclear Med. 73, 442-66(1955) Mar.

A questionnaire study showed no statistically significant differences between the frequencies of still births and miscarriages of the wives of radiologists (16.6 per cent) and in a control group of pathologist's wives (15.9 per cent). The infant mortality rates also were not significantly different in the children of the two groups, but the numbers were very small. It thus appears that the amount of radiation received by radiologists under usual conditions does not have any very large effect on fetal and infant death rates in their children. The problem of assessment of genetic effects is complicated by the fact that only a very small fraction of the total genetic damage would be detected as an increase in fetal and infant death rates in the first generation progeny. The negative results of this study are therefore regarded as having little bearing on the question of genetic hazards from exposure to radiation. (auth)

3026

CHORIORETINAL BURNS PRODUCED BY ATOMIC FLASH. Victor A. Byrnes, D. V. L. Brown, H. W. Rose, and Paul A. Cibis (U. S. Air Force School of Aviation Medicine, Randolph Field, Tex.). Arch. Ophthalmol. 53, 351-64(1955) Mar.

Potential danger to the retina produced by atomic flash beyond previously estimated distances is discussed. In exceptionally clear air the nominal atomic bomb (20 kt) can be expected to produce atomic chorioretinal lesions in humans up to 36 miles in the daytime and up to 40 miles at night. Larger nuclear devices would be expected to produce them at greater distances. The results obtained in the experimental exposure of 700 pigmented rabbits to the atomic flash are given. A therapeutic use for visible and infrared radiation of the eye is suggested. (auth)

3027

AN X-RAY ANALYSIS OF CHROMOSOME DUPLICATION. Karl Sax and Edward D. King (Harvard Univ., Jamaica Plain, Mass.). Proc. Natl. Acad. Sci. U. S. 41, 150-5(1955) Mar.

In response to x-ray induced aberrations, the Tradescantia microspore chromosomes react as single threads when irradiated during the resting stage, as double threads when rayed at prophase, and as four-partite strands when rayed at prometaphase and metaphase. The breaking of only one of the half-chromatids at metaphase, but of both as the resting stage, may be related to the nature of the half-chromatids at the time of duplication. The time of chromosome duplication as indicated by the types of x-ray-induced aberrations is compared with autoradiographs of DNA synthesis in microspore development and in the meiotic cycle. (auth)

3028

THYROIDECTOMIZING DOSE OF RADIOACTIVE IODINE IN HUMANS WITH MALIGNANT MELANOMA. Levona W. Olmsted and William H. Beierwaltes (University Hospital, Ann Arbor, Mich.). Cancer 8, 336-8(1955) Mar.-Apr.

Eight patients with metastatic malignant melanomas were given thyroidectomizing doses of I^{131}. Absolute beta assays of tumor and muscle biopsies were performed on four patients at varying intervals after administration of the dose. Tumor specimens consistently contained higher radioactivity per milligram of dry tissue than did muscle specimens. Clinically, no effect on tumor growth was noted regardless of tumor concentration of I^{131} or completeness of thyroidectomy. (auth)

3029

THE EFFECT OF HIGH AND LOW ROENTGEN INTENSITY ON DOMINANT LETHALS IN DROSOPHILA MELANOGAS-

TER. K. G. Lüning, Bo Lindell, and R. Falk (Inst. of Genetics, Univ. of Stockholm, and Inst. of Radiophysics, Stockholm, Sweden). Acta Radiol. 43, 89-92(1955) Jan.

By means of a discharge roentgen tube, the authors have tested the biologic effectiveness of high-intensity radiation. Drosophila males were irradiated with 800 to 900 r and after 7 days, mated to selected females of high egg-laying capacity. No significant difference in hatchability could be seen when high as compared to low intensity radiation was used, though the high intensity produced the irradiation dose within only 50 microseconds and the low intensity dose was given over 15 minutes. (auth)

3030

EFFECTS OF PILE RADIATION ON BARLEY SEEDS. L. Ehrenberg (Univ. of Stockholm. Sweden) and E. Saeland (Joint Establishment for Nuclear Energy Research, Kjeller, Norway). J. Nuclear Energy 1, 150-69(1954) Dec.

Barley seeds have been irradiated in the Kjeller heavy-water reactor, and the effects of different pile radiations on growth-rate, survival in the field, fertility, and mutation-rate have been studied. The seeds were irradiated at two different positions: (I) in the reactor center, where the biological doses of thermal, epithermal, and fast neutrons as well as γ-rays were determined; (II) in the concrete shield of the reactor, where the effect of non-thermal neutrons is negligible and different ratios of γ- and thermal neutron dose rates could easily be obtained. In position (I) the biological action must chiefly be ascribed to ascribed to non-thermal neutrons, the efficiency of which for the production of growth retardation, lethality, sterility, and mutation was found to be ten to forty times that of γ rays and x rays. It is indicated that a different distribution of mutations is obtained at different ion densities. The results obtained in position (II) indicate additivity of thermal neutrons and γ rays for the production of growth inhibition. The thermal neutrons seemed to be, per energy unit dissipated, more efficient than fast neutrons. (auth)

3031

THE INFLUENCE OF IONIZING RADIATION ON THE BODY FLUID COMPARTMENTS OF PATIENTS WITH MALIGNANT LYMPHOMA. Joseph Greenberg and Daniel Laszlo (Montefiore Hospital, New York). J. Clin. Invest. 34, 405-16(1955) Mar.

The effects of ionizing radiation were studied in four patients with malignant lymphomas under controlled metabolic conditions. Throughout the entire study two of the patients were maintained on a normal diet; two received a diet adequate in calories, low in protein and deficient in B-vitamins and certain minerals. Serial simultaneous determinations of the body fluid compartments were performed in conjunction with other studies such as measurements of the metabolic balances. During the control phase, except for a moderate plasma volume contraction observed in some of the patients, the fluid compartments were within normal limits. Ionizing radiation caused expansion of the extracellular fluid and plasma volumes at the expense of the intracellular compartment in all cases. The reduction in intracellular volume was much more marked in the patients on the restricted diet. Furthermore, the total body water decreased significantly and remained reduced during the entire period of post-radiation observation in the patients on the restricted diet. The extracellular fluid and plasma volumes, however, returned to preradiation levels within this period in all cases. The implications of these findings and their correlation with possible mechanisms of radiation injury are discussed. (auth)

3032

ELECTROLYTES AND WATER IN MUSCLES OF RAT FORELIMB AFTER INTENSE LOCAL X IRRADIATION. Walter S. Wilde and C. W. Sheppard (Tulane Univ. School of Medicine, New Orleans and Oak Ridge National Lab., Tenn.). Proc. Exptl. Biol. Med. 88, 249-53(1955) Feb.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-1077.

RADIATION HAZARDS AND PROTECTION

3033 UCLA-312

Atomic Energy Project, Univ. of Calif., Los Angeles

FAILURE OF HETEROLOGOUS SPLEEN EXTRACTS TO INCREASE SURVIVAL TIME IN IRRADIATED MICE. Thomas J. Haley, John Heglin, and Eve F. McCulloh. Oct. 27, 1954. 10p. Contract AT-04-1-GEN-12.

Crude beef spleen extract and its acidic and basic components were ineffective in counteracting the lethal effects of 550 r acute whole-body x irradiation when administered to mice on post-irradiation days one and two. These extracts acted synergistically with the irradiation decreasing survival time when given on days three and four. The possible reasons for such non-beneficial effects in radiation injury were discussed. (auth)

3034

ON THE PROTECTIVE MECHANISM OF THIOUREA ON MICE IRRADIATED WITH A LETHAL DOSE OF X RADIATION. E. H. Betz. Compt. rend. soc. biol. 148, 1915-18 (1954) Nov. (In French)

The injection of thiourea immediately before irradiation was found to produce protective effects where not influenced by subsequent injection of thyroxine. Additional tests were made with the thiourea administered orally over an extended period prior to irradiation. In this case, radiation resistance disappeared when thyroxine was injected. (K.S.)

3035

REMARKS CONCERNING SULPHYDRYL PROTECTION AGAINST MAMMALIAN RADIATION INJURY. Harvey M. Patt (Argonne National Lab., Lemont, Ill.). Proc. of the Symposium held at Liege, Aug.-Sept., 1954. London, Butterworths Scientific Publications, 1954. pp. 105-9.

Mechanisms involved in the protective action of sulphydryl substances, and cysteine in particular against radiation injuries are reviewed. (C.H.)

RADIATION SICKNESS

3036

PROPHYLAXIS AND THERAPY OF RADIATION SICKNESS BY MEANS OF BETA-MERCAPTOETHYLAMINE. V. Albano and L. Oliva. Radiologia (Rome) 11, 37-50(1955) Jan. (In Italian)

Beneficial effects are reported when 200 to 400 mg doses of β-mercaptoethylamine were administered to 23 patients suffering with radiation sickness following radium or x ray therapy. (C.H.)

RADIOTHERAPY

3037

COMPARATIVE SURVIVAL TIMES OF X-RAY TREATED VERSUS P^{32} TREATED PATIENTS WITH CHRONIC LEU-

KEMIAS UNDER THE PROGRAM OF TITRATED, REGULARLY SPACED TOTAL-BODY IRRADIATION. Edwin E. Osgood, Arthur J. Seaman, and Harold Tivey (Univ. of Oregon Medical School, Portland). Radiology 64, 373-81(1955) Mar.

A study was made of the survival times of 163 patients with chronic leukemias by the method of titrated, regularly spaced total-body irradiation. Twenty-three received spray roentgen irradiation; 140 were given P^{32}. The prognosis for survival was not significantly different whether the total-body irradiation was delivered externally by the spray technic or internally from radioactive phosphorus, provided all other conditions of treatment were identical. The prognosis for survival of patients with leukemia treated by titrated, regularly spaced total-body irradiation, either with the spray technic or P^{32}, is significantly better than that for a collected series including all radiation treated cases reported in the literature in the interval 1925 to 1951. (auth)

3038

CHANGES IN THE HUMAN LEUKOCYTE COUNT DURING X-RAY THERAPY FOR CANCER AND THEIR DEPENDENCE UPON THE INTEGRAL DOSE. Henry I. Kohn (Univ. of California School of Medicine, San Francisco). Radiology 64, 382-91(1955) Mar.

The change in count of each kind of leukocyte was followed in 48 selected patients undergoing a conventional course of x-ray therapy, planned for four to seven weeks. The tumor dose varied from about 3,000 to 6,000 r; the integral dose varied from about 1 to 50 megagram-r. A table for the estimation of the integral dose is presented. A new unit, the specific integral dose (megagram-r/kg.), is introduced. No significant change related to radiation dose was found for the basophil, eosinophil, or monocyte counts, or for the neutrophil count in patients receiving less than 10 megagram-r. In patients receiving more than 10 megagram-r, the neutrophil count, though variable, on the average fell to about 70 per cent of its initial level by the middle of the treatment period, thereafter remaining at about that level. The lymphocyte count tended to fall gradually throughout the course of treatment. Although several exceptions were noted, for irradiation of the trunk, neck, and pharynx, the magnitude and rate of fall of the lymphocyte count depended primarily upon the integral dose and integral dose rate rather than upon the tumor dose or the kind of tissue irradiated. At integral dose rates of 0.25 to 1 megagram-r/day, the smaller the daily dose, the smaller the total integral dose required to reduce the lymphocyte count to 25 per cent of its initial level. The minimum dose for this effect was about 7 megagram-r. (auth)

3039

FURTHER COMPARATIVE STUDIES OF X-RAY TRANSMISSION THROUGH THE ABDOMEN IN LIVING SUBJECTS. Joseph R. Nahon (V. A. Hospital, Brooklyn, N. Y.). Radiology 64, 392-7(1955) Mar.

3040

MODIFICATION OF ELECTRON FILTER TO IMPROVE LIGHT LOCALIZATION OF A COBALT-60 BEAM. Jasper E. Richardson and Marshall Brucer (Oak Ridge Inst. of Nuclear Studies, Tenn.). Radiology 64, 398-403(1955) Mar.

When short cone-to-skin distances are used with Co^{60} teletherapy units, it is advantageous to filter secondary electron emission with a thin sheet of cadmium over the cone aperture, in order to minimize the skin dose. If a narrow opening is left around the periphery of this filter, it can be further used to outline the geometrical penumbra. With this arrangement, a band of light delineates the true geometrical beam of gamma rays and the width of the geometrical penumbra. (auth)

3041

EXPERIMENTAL AND CLINICAL STUDIES WITH RADIOACTIVE COLLOIDAL GOLD IN THE THERAPY OF SEROUS EFFUSIONS ARISING FROM CANCER. Campbell Moses, Edward Kent, Joseph B. Boatman, R. D. Cole, Joseph, H. Sunder, R. S. George, Clem Russ, W. B. Ford, and E. R. Kutz (Univ. of Pittsburgh School of Medicine, Penna.). Cancer 8, 417-23(1955) Mar.-Apr.

The distribution and toxicity of colloidal radiogold (Au^{198}) after its intrapleural and intraperitoneal instillation in rats have been studied. No significant complications were encountered with doses comparable to those used clinically. The Au^{198}, intrapleural, fifteen-day LD_{50} for rats was approximately 20 microcuries per gram body weight. The intrapleural administration of Au^{198} to mice with spontaneous lung tumors failed to produce any but the most superficial surface effects. In dogs the administration of a single dose of 5 mc per kg intrapleurally produced a mild leukopenia and local pleural reaction, but no sharply deleterious effects. The subcutaneous injection of 10 to 40 mc of Au^{198} about fresh surgical wounds increased the induration in the area but no wound separation occurred nor was there any delayed healing. Complete cessation or marked retardation of fluid formation followed the intracavitary injection of Au^{198} in approximately one half of 163 patients with metastatic carcinoma and pleural effusion or ascites. This response, together with the absence of serious toxic reactions, indicates that radiogold is a useful, but far from ideal, therapeutic weapon in the management of this problem. (auth)

3042

SLIDE RULE NOMOGRAMS FOR COBALT 60. Paul Pfalzner (Victoria Hospital, London, Ontario, Canada). Brit. J. Radiol. 28, 170-2(1955) Mar.

3043

A VITAMIN C-FREE DIET IN RADIATION THERAPY OF MALIGNANT DISEASES. Theodore R. Miller and Boris Sokoloff. Am. J. Roentgenol. Radium Therapy Nuclear Med. 73, 472-80(1955) Mar.

3044

PROBLEMS AND RESULTS OF RADIOBIOLOGY AND THEIR MEANING IN CANCER THERAPY. Werner Lorenz. Strahlentherapie 96, 169-200(1955) Feb. (In German)

A discussion of the present stage of radiologic research makes evident that the scope of problems which originally was confined to the field of physics has since extended to include radiochemistry and, to a continuously increasing degree, the field of radiopharmacology. 319 references. (auth)

TOXICOLOGY STUDIES

3045 AEC-tr-2088

PHARMACODYNAMIC PROPERTIES OF THE CHLORHYDRATE OF CHLORO-3(DIMETHYLAMINO-3' PROPYL)-PHENOTHIAZINE (4.560 R. P.) EXPERIMENTAL STUDY OF A NEW COMPOUND USED IN POTENTIAL ANESTHESIA AND ARTIFICIAL HIBERNATION. Simone Courvoisier, Julien Fournel, Rene Ducrot, Madeleine Kolsky, and Pierre Koetschet. Translated by Gretchen Riese from Arch. intern. pharmacodynamie 92, 305-61(1953). 61p.

3046

THE VASODEPRESSOR RESPONSE OF FLUORINE ADMINISTERED ORALLY TO DOGS. Alfred W. Richardson, Joseph C. Muhler, and Jack G. Bishop (Univ. of Indiana, Bloomington). J. Pharmacol. Exptl. Therap. 113, 200-5 (1955) Feb.

The oral administration to dogs of 5 mg of fluorine as sodium fluoride or stannous fluoride resulted in hypotension. Sodium fluoride containing 1 mgm of fluorine the amount orally ingested daily by the average person from a communal water supply containing 1.0 ppm, did not elicit a hypotensive response. In the conditions where sufficient fluorine was administered to alter the blood pressure, there were changes in the heart rate, pulse pressure and blood flow as would be expected with a hypotensive agent. Stannous fluoride elicited also a decline in the rectal and gastrocnemius muscle temperatures. (auth)

TRACER APPLICATIONS

3047 NYO-4917

Atomic Energy Medical Research Project, Western Reserve Univ.

CLINICAL CLEARANCE RATE MEASUREMENTS FOR THE ACCUMULATION OF I^{131} BY THE THYROID GLAND. PART II. CLINICAL EVALUATION. John P. Storaasli, William J. MacIntyre, Hymer L. Friedell, and Keith E. Weigle, Jr. Mar. 18, 1955. 35p. Contract W-31-109-eng-78.

By clinical evaluation 132 patients were classified as euthyroid or hyperthyroid and a comparison made of the thyroid clearance rate and of the 2 and 24 hour uptake of I^{131} by the thyroid gland. In addition, a group of patients whose 24 hour uptakes were between 40% and 50% were similarly studied to see whether the additional information would aid in separating them as to their clinical status. The various physiological circumstances that would complicate the interpretation by various I^{131} accumulation methods are discussed along with the factors that have led our laboratory to select specific tests to be applied for routine use for more complete evaluation. (cf. NYO-4966.) (auth)

3048 UCRL-2853

Radiation Lab., Univ. of Calif., Berkeley

PHOTOSYNTHESIS. James A. Bassham and M. Calvin. Feb. 1955. 34p. Contract W-7405-eng-48.

The over-all process of photosynthesis involves a number of interconnected processes. These processes, which are cyclic with respect to both energy and material, are related at some points to well-known respiratory processes. The carbon-reduction cycle in photosynthesis is now known in detail. All enzymes involved in this cycle have been isolated and the sources of energy required for its operation have been identified in terms of reducing agents and high-energy phosphate. These sources of energy are derived ultimately from absorbed ligh energy which brings about the photolysis of water. Possible mechanisms for this photolysis and for the transfer of energy from the photolysis products to the carbon-reduction cycle are discussed here. Experimental data, in the form of quantum efficiency measurements, are presented and partially confirm the theories proposed for the mechanisms of energy transfer. A diagram of the complete process of photosynthesis containing the several cycles and their relations is presented. (auth)

3049

THE USE OF THE ISOTOPE ^{51}Cr AS A LABEL FOR RED CELLS. P. L. Mollison (Post-graduate Medical School of London, England) and N. Veall (Guy's Hospital, London, England). Brit. J. Haematol. 1, 62-74(1955) Jan.

Red cells obtained from 11 normal subjects were labelled with Cr^{51} and re-injected. Estimates of the amount of Cr^{51} remaining in the circulation, when plotted against time, fell upon a curvilinear slope. This curve was found to have at least two components so that during the first 24 hours after injection the rate of loss of Cr^{51} from the circulation was distinctly greater than it was subsequently. Simultaneous estimates of red-cell volume using P^{32} and Cr^{51} in 14 subjects showed close agreement. The rate of disappearance of Cr^{51} from the circulation showed only very slight variation between subjects. The method thus appears to be highly suitable for detecting any departure from the normal rate of elimination of red cells. (auth)

3050

ANAEMIA AND ERYTHROPOIESIS IN THE IRRADIATED RAT. AN EXPERIMENTAL STUDY WITH PARTICULAR REFERENCE TO TECHNIQUES INVOLVING RADIOACTIVE IRON. C. F. Baster, E. H. Belcher, Eileen B. Harriss, and L. F. Lamerton (Royal Cancer Hospital, London, England). Brit. J. Haematol. 1, 86-103(1955) Jan.

The distribution of subcutaneously injected radioactive iron in bone marrow, spleen and liver, its uptake in the red cells, and its elimination in the faeces have been studied in normal rats, and in rats receiving whole-body and partial-body x irradiation. Rats of two strains have been employed. By these means, it has been possible to follow quantitatively the radiation response of the erythropoietic system. The effects of shielding one hind limb and of splenectomy with and without hind-limb shielding on the pattern of response and the severity of the post-irradiation anaemia have been investigated. (auth)

CHEMISTRY

3051 AD-15788

Stanford Univ.

THE REACTION OF NITRIC ACID VAPOR WITH CERTAIN REDUCING GASES. Harold S. Johnston and Louise Foering. June 1951. 19p.

3052 ISC-565

Ames Lab.

THE SOLUBILITY OF SOME METALS IN THEIR MOLTEN HALIDES. J. D. Corbett and S. von Winbush. Jan. 27, 1955. 15p. Contract W-7405-eng-82.

The apparent solubilities of six metals in their respective molten halides have been measured, using the salts $SnCl_2$, $SnBr_2$, $PbCl_2$, TlCl, AgCl, $GaCl_2$, and AlI_3. A comparison of the lead and tin data with known metal solubilities in the alkaline earth and cadmium(II) halides shows a generally decreasing solubility with decreasing electropositive character of the metal. In contrast to the intensely colored or darkened systems usually obtained in such systems, the Al-AlI_3 and Ga-$GaCl_2$ systems are colorless, and the formation of subhalides seems reasonable. A seemingly significant correlation of the solubility of aluminum in AlI_3 with a theoretical calculation of the stability of AlI can be obtained. The formation of gaseous subhalides from the reaction of tin(II) or lead(II) chloride and excess tin or lead in the temperature ranges of 550 to 950° and 500 to 575°, respectively, does not appear likely. (auth)

3053 ISC-581
Ames Lab.
THE LOWER OXIDATION STATES OF GALLIUM. I. THE GaI_3-GaI_2-GaI SYSTEM. J. D. Corbett and R. K. McMullan. Feb. 24, 1955. 14p. Contract W-7405-eng-82.

Gallium(II) iodide has been observed to disproportionate into gallium(III) iodide and gallium(I) iodide, instead of the trihalide and the metal that are obtained with gallium(II) chloride. A phase diagram and powder patterns confirm the existence of the two lower iodides. Gallium(II) iodide is only moderately stable at the melting point of 211°; gallium(I) iodide is sufficiently unstable that in the presence of excess gallium only a limiting composition of $GaI_{1.19}$ is obtained at a melting temperature of 265°. Gallium(I) iodide has been isolated from the limiting mixture by means of a benzene extraction. The demonstration of the existence of the gallium(I) oxidation state in this system tends to favor the formulation Ga(I) $[Ga(III)I_4]$ for the diamagnetic gallium[II] iodide. (auth)

3054 NBS-5A-193
National Bureau of Standards
DIMETHYLPHOSPHINOBORINE TRIMER: MASS SPECTRA AND THERMAL DECOMPOSITION. R. E. Florin, L. A. Wall, F. L. Mohler, and Edith Quinn. Oct. 22, 1953. 5p.

3055 UCRL-4432
Radiation Lab., Univ. of Calif., Livermore
THE REACTIONS OF LITHIUM BOROHYDRIDE AND SODIUM TRIMETHOXYBOROHYDRIDE WITH B^{10}-ENRICHED BORON TRIFLUORIDE ETHERATE. John W. Kury and William L. Jolly. Dec. 27, 1954. 9p. Contract W-7405-eng-48.

The reactions of lithium borohydride and sodium trimethoxyborohydride with B^{10}-enriched boron trifluoride were studied. The isotopic composition of the resulting diborane was determined mass-spectrometrically, and the various possible mechanisms consistent with the experimental results were discussed. (auth)

3056 AEC-tr-2093
DEFINITIONS OF THE CONCEPTS OF "ACID" AND "BASE." A. I. Shatenstein. Translated from Zhur. Obshchei Khim. 9, 1603-10(1939). 18p.

3057
HYDROGEN ISOTOPE EFFECTS IN THE ALKALINE CLEAVAGE OF TRIORGANOSILANES. Louis Kaplan and K. E. Wilzbach (Argonne National Lab., Lemont, Ill.). J. Am. Chem. Soc. 77, 1297-1302(1955) Mar. 5.

The effects of isotopic substitution on the rates of hydrolysis of triphenyl- and tripropylsilane in piperidine—water and ethanol—water solvents have been studied in order to acquire information concerning the reaction mechanisms. Substitution of deuterium or tritium for protium in either the silane or the solvent in every case reduced the reaction rate. The results indicate that the rate-determining step in the reaction involves the rupture of silicon—hydrogen bond and that in the transition state the hydrogen atom from the silane is strongly bonded to that from the solvent. (auth)

3058
ISOTOPIC EXCHANGE REACTIONS IN LIQUID SULFUR DIOXIDE. IV. KINETICS OF THE CATALYZED S^{35}-EXCHANGE BETWEEN THIONYL CHLORIDE AND SULFUR DIOXIDE. B. J. Masters and T. H. Norris (Oregon State Coll., Corvallis). J. Am. Chem. Soc. 77, 1346-52(1955) Mar. 5.

Extending earlier work, a study has been made of the kinetics of the chloride-catalyzed S^{35} exchange reaction between liquid sulfur dioxide and thionyl chloride. Whereas rubidium and tetramethylammonium chlorides are effective catalysts, acid chlorides (aluminum and hydrogen chlorides) are found to be far less, if at all, active. A basic catalysis by chloride ion is proposed. Experiments both in excess sulfur dioxide and in exess thionyl chloride indicate the rate law Rate = k_3 (catalyst)$(SOCl_2)(SO_2)$. With tetramethylammonium chloride in excess sulfur dioxide the rate constant is about 0.06 $1.^2$ mole $^{-2}$ hr.$^{-1}$ (0^0), while rubidium chloride gives ca. 0.03 $1.^2$ mole^{-2} hr.$^{-1}$; in a large excess of thionyl chloride tetramethylammonium chloride gives about 0.22 $1.^2$ mole^{-2} hr.$^{-1}$. For these three systems, activation energies are, respectively, 14.7, 14.7 and 13.6 kcal./mole and entropies of activation are −28.1, −29.5, and −29.6 cal deg.$^{-1}$. A mechanism for the reaction is suggested. Comparison with the thionyl bromide-sulfur dioxide exchange reveals that, whereas the latter system shows, with tetramethylammonium bromide, a comparable activation energy of 13.2 kcal./mole, the rate is only about one-seventh as great as in the present case, possibly explicable in terms of a greater basicity for chloride than for bromide ion. (auth)

3059
DIPOLE MOMENT AND RESTRICTED ROTATION IN FOUR FLUOROCHLOROETHANES, 1,1,2-TRICHLOROETHANE AND CHLOROMETHYL METHYL ETHER. Armand Di Giacomo and Charles P. Smyth (Princeton Univ., N. J.). J. Am. Chem. Soc. 77, 1361-4(1955) Mar. 5.

The dielectric constants of the vapors of 1-chloro-1,1-difluoroethane, 1-fluoro-2-chloroethane, 1,1-difluoro-2,2-dichloro-ethane, 1,1,2-trichloroethane, 1-fluoro-1,2,2-trichloroethane, and chlormethyl methyl ether have been measured over a range of temperature and pressure and used to calculate the molecular dipole moments as functions of temperature. The dipole moment of 1-chloro-1,1-difluoroethane, 2.14×10^{-18}, is independent of temperature, but the moments of the other four ethanes increase with rising temperature. These moment values are used to examine the restriction of rotation of one-half of the molecule relative to the other and to calculate the energy differences between possible rotational isomers. The results are found to compare satisfactorily with the conclusions to be drawn from the potential energy curves calculated as the sums of the energies of steric repulsion, dipole—dipole interaction, London attractive or dispersion forces, and dipole induction between the two halves of the molecule. The moment found for chloromethyl methyl ether is indistinguishable from the value calculated for the case of unrestricted rotation around the central C—O axis and varies so little with temperature as to indicate that change of temperature does not shift the distribution of the molecular halves sufficiently to change the moment appreciably. (auth)

3060
QUANTITATIVE STUDY OF THE BONDING OF CHLOROFORM-d IN VARIOUS SOLVENTS BY INFRARED SPECTROMETRY. R. C. Lord, B. Nolin, and H. D. Stidham (Massachusetts Inst. of Tech., Cambridge). J. Am. Chem. Soc. 77, 1365-8(1955) Mar. 5

Infrared studies have shown that the intensity of the carbon—deuterium stretching band in chloroform-d increases tenfold or more when the latter is mixed with certain solvents. This increase has been measured quantitatively for diethyl and di-n-butyl ethers, p-dioxane, anisole, acetone, acetic anhydride, ethyl acetate and pyridine. The association constant for the system diethyl ether—chloroform-d has been found to be 0.80 ± 0.151. mole^{-1} from the infrared data. A new method of preparation of chloroform-d is described. (auth)

3061

PHOTOINITIATED OXIDATION OF BENZOIC ACID BY FERRIC IONS IN AQUEOUS SOLUTION. Jerome Saldick and Augustine O. Allen (Brookhaven National Lab., Upton, N. Y.). J. Am. Chem. Soc. 77, 1388-90(1955) Mar. 5

3062

RATE THEORY AND HOMOGENEOUS REACTIONS. David Garvin (Princeton Univ., N. J.). Ind. Eng. Chem. 47, 594-9 (1955) Mar.

Advances in the field of kinetics dealing with oxidation, pyrolysis, free radical elementary steps, exchange reactions, isotope effects, and halogenation of organic compounds are reviewed. 138 references. (L.T.W.)

3063

COLLOIDS AND SURFACE BEHAVIOR. W. O. Milligan and G. S. Mill (Rice Inst., Houston, Tex.). Ind. Eng. Chem. 47, 614-25(1955) Mar.

This review deals with selected portions of the field of theoretical and applied colloid chemistry. References are included on general studies, experimental methods and devices, adsorption (adsorption of gases on solids, theory), pore sizes and surface areas, adsorption from solution, colloid systems, lyophobic and lyophilic colloids, association colloids and colloidal electrolytes, gels aerosols, emulsions, foams, stability of colloid systems, kinetic properties, surface and interfacial tensions, optical properties, ultrasonics, dielectric properties, and structure of colloidal materials (amorphous or glassy state, thin films, gel structure, electron diffraction, electron microscopy). 593 references (L.T.W.)

3064

THE STRUCTURE OF TiAs. K. Bachmayer, H. Nowotny, and A. Kohl. Monatsh. chem. 86, 39-43(1955) Feb. (In German)

In the system Ti—As many intermediate phases occur. In the approximate composition TiAs two phases are identified. One phase crystallizes in the NiAs type with a lattice constants a = 3.63kX · E, c = 6.14kX · E and a/c = 1.69. The second is a similar type to LiP and has the lattice constant a = 3.64kX · E, c = 12.2kX · E, and a/c = 3.38. Its structure is in direct relationship. (tr.-auth)

3065

THE COSMIC ABUNDANCES OF POTASSIUM, URANIUM, AND THORIUM AND THE HEAT BALANCES OF THE EARTH, THE MOON, AND MARS. Harold C. Urey (Univ. of Chicago). Proc. Natl. Acad. Sci. U. S. 41, 127-44(1955) Mar.

Reasons have been given for believing that the abundances of the elements K, U, and Th in the chondritic meteorites are higher than the mean abundances of these elements in planetary bodies by about a factor of 3.19. Using decreased abundances of these elements, it is shown that the thermal properties of the earth, the permanent nonequilibrium shape of the moon, and the absence of a core in the planet Mars can be understood. The lower abundance of potassium gives a more regular curve for the abundance of elements in this region of the periodic system, though it disagrees with the astronomical data in this respect. It is difficult to secure sufficient heat for this purpose on the basis of abundances of K, U, and Th as used in this paper. It is suggested that Al^{26} may have supplied the radioactive heat for this purpose and that other heating processes previously suggested may have been important as well. As an alternative, it is also possible that depletion of these radioactive elements in the earth, the moon, and Mars during their formation may account for the lower abundances of these elements required to secure reasonable thermal histories for these planets. (auth)

3066

AN INFRARED STUDY OF THE BF_3-BCl_3 REACTION. R. E. Nightingale and Bryce Crawford, Jr. (Univ. of Minnesota, Minneapolis). J. Chem. Phys. 22, 1468(1954) Aug.

A preliminary kinetic study is presented of the gas-phase reaction $BF_3 + BFCl_3 \rightarrow BFCl_2 + BF_2Cl$, using a fast-scanning infrared spectrometer to follow the change in intensity of the appropriate abosrption bonds. The reaction apparatus and preparation of the materials used are briefly discussed. The infrared spectra of the BF_3-BCl_3 reaction is shown. (J.A.G.)

3067

ELECTROCHEMICAL BEHAVIOR OF A TITANIUM-FUSED SALT-PLATINUM CELL. M. E. Straumanis and A. W. Schlechten (Univ. of Missouri, Rolla). J. Electrochem. Soc. 102, 131-6(1955) Mar.

The cell, Ti/NaCl or KCl fused/Pt at temperatures above 800°C and in air, displays a substantial open-circuit potential difference of 1.40 to 1.53 v. In vacuum or under an inert gas the difference is approximately 0.5 v, and the current that can be drawn from such a cell is low. Air, oxygen, and water vapor act as cathodic depolarizers, maintaining a positive potential of the cathode and an appreciable current if the cell is short circuited. The reaction occurring in the cell is $Ti + 4NaCl + O_2 = TiCl_4 + 2Na_2O$. Alkali oxides are produced on the cathode if a salt containing Ti ions is electrolyzed in presence of air. Under an inert gas the discharge of alkali ions hampers the deposition of Ti, which is then produced in the form of a powder, and possibly as the result of a secondary reaction wherein it is reduced by the alkali metals. (auth)

ANALYTICAL PROCEDURES

3068 DTMB-867

David W. Taylor Model Basin

A METER FOR CONTINUOUS INDICATION OF DISSOLVED AIR IN WATER. H. M. Fitzpatrick and M. E. Harkleroad. Oct. 1954. 22p. (AD-44196)

An instrument is described which continuously measures the concentration of dissolved gases in liquids. The operation of the instrument is based on the establishment of equilibrium between the continuously flowing liquid sample and a gas space of constant volume. The equilibrium pressure in the gas space indicated the concentration of dissolved gases. Experimental confirmation of the validity of the method is presented for air dissolve in water. The design of a practical instrument and criteria for its improvement are given. (auth)

3069 MLRR-170

Chemical Corps Medical Labs., Army Chemical Center

QUANTITATIVE DETERMINATION OF DIBORANE IN AIR. Leo Feinsilver. Feb. 1953. 39p. (AD-9935)

Spectrophotometric methods were developed for the quantitative determination of B_2H_6 concentrations in air in the 1- to 3-mg/m^3 range with an accuracy within 0.1 mg/m^3. Samples in 1-l collecting cylinders were treated with a known excess of Br reagent. The residual Br was determined from the UV-light absorption of a solution of the microquantity of Br in glacial AcOH saturated with KBr. The absorption in the 250- to 330-mμ range followed Beer's law; a peak occurred at 270 mμ. B_2H_6 was also determined by quantitative collection in ethyl Cellosolve which was contained in an absorption column filled with glass beads. The H_3BO_3 present after hydrolysis of the collected gas was determined colorimetrically with carmine. The vapor-phase hydrolysis of B_2H_6 to H_3BO_3 was negligible. (ASTIA abst.)

3070 NBL-104
New Brunswick Lab., AEC
DETERMINATION OF OXYGEN IN CALCIUM METAL. A. R. Eberle, M. W. Lerner, and G. J. Petretic. Mar. 1955. 16p.

A simple and rapid procedure is given for the determination of oxygen in calcium. The method is based on the reaction of the oxide with acid to produce water. The water which is liberated is determined by titration with Karl Fischer reagent. The method is satisfactory for calcium containing more than 0.05% oxygen. (auth)

3071 UCRL-2862
Radiation Lab., Univ. of Calif., Berkeley
AMINO ACID COMPOSITION OF THE PROTEINS OF THE SERUM LIPOPROTEINS. Bernard Shore. Feb. 10, 1955. 6p. Contract W-7405-eng-48.

Paper chromatographic studies on the amino acid composition of the protein moieties of the S_f6 (hydrated density 1.035 g/ml), S_f13 (hydrated density 1.015 g/ml), S_f4 to 20 (hydrated density 1.006 to 1.04 g/ml), S_f20 to 400 (hydrated density 1.006 to about 0.96 g/ml), high-density (containing molecules of hydrated density 1.075 and 1.145 g/ml), and 1.145 g/ml hydrated density lipoproteins of serum indicate the proteins to be of quantitatively identical amino acid composition, both with respect to type and percentage of amino acid present. These amino acids are valine, lysine, aspartic acid, glutamic acid, arginine, histidine, glycine, alanine, tyrosine, leucine, phenylalanine, proline, and cysteine. Methinoine may also be present, but in less percentage than the other amino acids. (auth)

3072
A MODIFIED IODIMETRIC ESTIMATION OF VANADIUM. M. R. Verma and V. M. Bhuchar (National Physical Lab. of India, New Delhi). J. Sci. Ind. Research (India) 14B, 19-24 (1955) Jan.

An iodimetric method for the estimation of vanadium by the reduction of pentavalent vanadium to the tetravalent state by a citrate in acidic medium has been described. The method is applicable over a wide range of concentration (4 to 40 mg.) of vanadium pentoxide and is more satisfactory for certain estimations than the sulphur dioxide reduction method reduction method or the ferrous ammonium sulphate method. (auth)

3073
TECHNIQUE OF X-RAY SPECTROGRAPHIC DETERMINATION OF HAFNIUM IN ZIRCONIUM MINERALS AND CONCENTRATES. E. E. Vainshtein, I. D. Shevaleevskii, and I. F. Shtauberg. (Vernadskii Inst. of Geochemistry and Analytical Chemistry). Zhur. Anal. Khim. 10, 14-19(1955) Jan.-Feb. (In Russian)

3074
QUANTITATIVE SPECTRAL ANALYSIS OF ZIRCONIUM FOR HAFNIUM CONTENT. G. Kryuger, R. R. Shvangiradze, and T. A. Mozgovaya. Zhur. Anal. Khim. 10, 20-7(1955) Jan.-Feb. (In Russian)

3075
SPECTROPHOTOMETRIC DETERMINATION OF CHROMIUM (III) BY THE DISODIUM SALT OF (ETHYLENEDIAMINE) TETRAACETIC ACID (COMPLEXONE III). R. Fernandez Cellini and E. Alonso Valiente. Anales real soc. espan. fis. y quin. (Madrid) Ser. B 51, 47-52(1955) Jan. (In Spanish)

A spectrophotometric method for Cr^{+3} determination is established; hot and weak acid solutions are treated by disodium etilen-diamino-tetra-acetic acid (Complexone III) yielding a violet very stable quelate, which follows Beer's law between one and $7\gamma Cr^{+3}$/ml; these concentrations are employed in the experiences of this work. The absorption spectrum of Cr^{+3} – Complexone III has two maximums at 396 mμ and 538 mμ; the maximum at 538 mμ is utilised in this method. Time, temperature, pH and Complexone III concentration are studied and the best experimental conditions are fixed. (auth)

3076
A MANUAL OF PAPER CHROMATOGRAPHY AND PAPER ELECTROPHORESIS. Richard J. Block (New York Medical Coll. and Borden Co., Yonkers, N. Y.), Emmett L. Durrum (Walter Reed Army Medical Center, Washington, D. C.), and Gunter Zweig (Charles F. Kettering Foundation, Yellow Springs, Ohio). New York, Academic Press, Inc., Publishers, 1955. 484p.

Part I discusses the theory of paper chromatography and summarizes tried and proved procedures employing relatively simple equipment and available reagents. General and and quantitative methods for paper chromatography are discussed, and specific directions are included for application of the method to the separation and determination of amino acids, amines, proteins, carbohydrates, aliphatic acids, steroids, bile acids, purines, pyrimidines, and related substances phenols, aromatic acids, and porphyrins, antibiotics, vitamins, and miscellaneous organic substances. Part II discusses the theory of paper electrophoresis, general methods, two dimensional techniques, continuous electrophoresis, and quantitative considerations. 1280 references. (C.H.)

3077
DETERMINATION OF HYDROGEN IN TITANIUM. T. D. McKinley (E. I. du Pont de Nemours and Company, Newport, Del.). J. Electrochem. Soc. 102, 117-23(1955) Mar.

A simple, rapid, precise method for determination of hydrogen in titanium is described. It is based on measurement of the equilibrium pressure of hydrogen over the metal in a closed system under predetermined conditions. Construction, calibration, and operation of the analytical equipment are described. Hydrogen can be determined in the range 0.001 to 0.33 wt. % with a probable error of about 5%. The physical form of specimens is unimportant. Twenty analyses can be made in an 8-hr period. (auth)

DEUTERIUM AND DEUTERIUM COMPOUNDS

3078 AEC-tr-2091
THE ELECTROLYTIC DISSOCIATION OF HEAVY WATER. E. Abel, E. Bratu, and O. Redlich. Translated from Z.

physik. Chem. (A) 173, 353-64(1935). 10p. Available from Associated Technical Services (Trans. 05G5G), East Orange, N. J. (AEC-tr-2091)

The electromotive force of the cells D_2, DCl (0.1M), AgCl, Ag and D_2, NaOD (0.1M) + NaCl (0.1M), AgCl, Ag was determined. The ratio of the electrolytic dissociation constants of D_2O and H_2O is calculated from this as $K_2:K_1$ = 0.16_6 (21°). It is shown that the product of the total activity of the hydrogen ion species and the total activity of the hydroxyl ion species depends only on the stoichiometric isotopic composition, i.e., it is the same for solutions of acids and bases in the same water. This product, the ionization function, which can be calculated from measurements such as those carried out by us, plays a part in the case of mixtures of light and heavy water similar to that of the dissociation constant for pure water. The "normal potential" of deuterium (in heavy water), relative to the hydrogen electrode (in light water), is -0.003_4 volt. The absolute value of the potential of the silver chloride electrode (relative to the deuterium electrode) is smaller by the same amount in heavy water than in light water. (auth)

3079

HYDROGEN PEROXIDE AND ITS ANALOGUES. VI. INFRARED SPECTRA OF H_2O_2, D_2O_2, AND HDO_2. Osias Bain and Paul A. Giguère (Laval Univ., Quebec, Canada). Can. J. Chem. 33, 527-45(1955) Mar.

The absorption spectrum of hydrogen peroxide was reexamined with a prism instrument in the region 1.5 to 25μ. A pair of well-resolved perpendicular bands arising from torsional oscillation of the OH groups were found centered about 460 and 575 cm^{-1}. The overtone band at 3.8μ was shown to be a hybrid with prominent rotational structure and some indications of doubling. Its assignment to the combination $\nu_2 + \nu_6$ implies a positive anharmonicity. Four new overtone bands were observed in liquid hydrogen peroxide. The infrared spectrum of deuterium peroxide was measured for the first time in the solid and vapor states. The vapor bands are quite different in appearance from those of hydrogen peroxide. One of the fundamentals, the asymmetric O—D stretching at 2661 cm^{-1}, was resolved sufficiently to allow calculation of the rotational constants of the isotopic molecule. Mixtures of the two peroxides containing around 40% of HDO_2 were also investigated; from the results the frequency of the as yet unobserved symmetric modes ν_1 and ν_2 could be estimated with fair certainty. The O—O stretching vibration at 11μ was too weak to be located definitely in the spectra of the gaseous peroxides. The structural parameter of the H_2O_2 molecule are now established as follows: $r_{O-O} = 1.49 \pm 0.01$ A; $r_{O—H} = 0.97 \pm 0.01$ A; and $\alpha_{OOH} = 100° \pm 2°$. The O—H and O—D stretching bands were studied in solutions of the three isotopic peroxides in carbon tetrachloride. (auth)

3080

ROTATIONAL CONSTANTS OF SiH_3D. Santiago R. Polo and M. Kent Wilson (Harvard Univ., Cambridge, Mass.). J. Chem. Phys. 22, 1559-61(1954) Sept.

The analysis of the rotational structure of the Si—D stretching fundamental yields the following values: $B'' = 2.11 \pm 0.01$ cm^{-1}, $B'' - B' = 0.019$ cm^{-1}, $\nu_0 = 1594.4 \pm 0.1$ cm^{-1}. The value of the Si—H distance obtained under the assumption that it remains unchanged by isotopic substitution is $d_{Si-H} = 1.47_7 \pm 0.003$ A. (auth)

FLUORINE AND FLUORINE COMPOUNDS

3081 AD-5787

Cryogenic Lab., Ohio State Univ.

[LOW TEMPERATURE THERMODYNAMICS OF INORGANIC SUBSTANCES]. TECHNICAL REPORT NO. 20. THE INTERMOLECULAR FORCE CONSTANTS OF FLUORINE. David White, Jih-Heng Hu, and Herrick L. Johnston. Jan. 26, 1953. 10p. Contract N6onr-225, T. O. IV. (TR-283-20)

Pressure measurements were made at temperatures between 80 and 300°K on F gas samples which were introduced into a condensed gas calorimeter at 300°K and 1 atm. The difference between the virial coefficients in the equation of state PV = RT + BP at 2 temperatures was calculated from these measurements and the ratio of the dead space to calorimeter volume. By assuming that the gas imperfection in F results from binary collisions of spherical nonpolar molecules and by using, as a first approximation, a value of the virial coefficient at 300°K (B_0) equal to that of oxygen, a set of force constants was calculated by fitting the F data to a Lennard-Jones potential function. The B_0 calculated from these force constants was −19 cc; refitting of the data to the potential function gave force constants of $r_0 = 3.61 \pm 0.04$A and $\Sigma o/k = 121 \pm 3°$. The viscosity of F calculated from these values agreed with the experimental results of Aoyama and Kanda (Bull. Chem. Soc. Japan 12, 463-68 (1937) above 90°K. The critical temperature of F was estimated as 161.3 ± 4°K. (auth)

3082 NBS-5A-192

National Bureau of Standards

DEVELOPMENT OF HEAT-RESISTANT POLYMERS. PROGRESS REPORT [FOR] JULY 1 TO SEPTEMBER 30, 1953. Oct. 20, 1953. L. A. Wall. 18p. Contract DA-599-01-ORD-004.

3083 NP-5551

Minnesota Mining and Manufacturing Co.

[SYNTHESIS AND EVALUATION OF NEW POLYMERS]. QUARTERLY PROGRESS REPORT NO. 22 [FOR] AUGUST 15, 1954 THROUGH NOVEMBER 15, 1954. F. A. Bovey. 25p. Contract AF33(038)-515.

The object of the research described in this report is the preparation and evaluation of fluorine-containing elastomers with very wide useful temperature ranges and resistance to a wide variety of solvents, hydraulic fluids, lubricants, and other liquids. Further study has been given to homopolymers and copolymers of fluorinated dienes. A copolymer of perfluorobutadiene and vinyl 1,1-dihydroperfluorobutyl ether prepared using a 3:1 molar charge ratio has been found to have good high temperature properties when compounded with carbon black alone and no vulcanizing agents. It retained useful properties after 400 hours heating in air at 400°F. Copolymers of 1,1,2-trifluorobutadiene with 1,1-dihydroperfluorobutyl acrylate (FBA) have been prepared. They have good tensile strength and solvent resistance but poor resistance to ozone and heat. Alum coagulation of poly-FBA latex continues to give products exhibiting erratic curing behavior, due to residual acidity. Freeze coagulation appears to be more successful, although gel formation may occur. This may be connected in part with the presence of polyvalent cations in the wash water. Longer aging tests of Sulfasan R as an antioxidant for the dry heat aging of polyamine-cured poly-FBA indicate a service life of about 500 hours at 350°F. In Turbo Oil this additive is less successful, actually increasing the swelling after 500 hours at 350°F. Most of the synthesis effort has been devoted to new routes for preparing fluorine-containing alkoxy acrylates, particularly γ-perfluoromethoxy-1, 1-dihydroperfluoropropyl acrylate (FMFPA). (auth)

3084

HYDROGEN BONDING IN SODIUM TRIFLUOROACETATE–TRIFLUOROACETIC ACID COMPOUNDS. William Klemperer and George C. Pimentel (Univ. of California, Berkeley). J. Chem. Phys. 22, 1399-2(1954) Aug.

The dissociation pressure of trifluoroacetic acid over two compounds with sodium trifluoroacetate has been measured from 25° to 40°C. One compound is $CF_3COONA{\cdot}2CF_3COOH$, and the other is probably $CF_3COONa{\cdot}CF_3COOH$. The infrared spectra of $CF_3COONa{\cdot}2CF_3COOH$, $CF_3COONa{\cdot}2CF_3COOD$, and CF_3COONa have been measured in the spectral region 4000 to 650 cm^{-1}. The stability of these salt-acid compounds is attributed to strong hydrogen bonding. The heat of dissociation of $CF_3COONa{\cdot}2CF_3COOH$ is +14 kcal per mole of monomeric trifluoroacetic acid, and the OH stretching frequency is found 1150 cm^{-1} below its location in the monomeric acid. (auth)

3085

ORGANIC FLUORINE COMPOUNDS. I. AN IMPROVED SYNTHESIS OF HEXAFLUOROACETONE. A. T. Morse, P. B. Ayscough, and L. C. Leitch (National Research Council, Ottawa, Ontario, Canada). Can. J. Chem. 33, 453-7(1955) Mar.

The synthesis of hexafluoroacetone reported recently by Brice, Lazerte, Hals, and Pearlson has been improved in several particulars. Teflon was depolymerized to tetrafluoroethylene which was then dimerized to give a 50% yield of perfluoroisobutene in one step. Oxidation of the latter at 35 to 40°C with aqueous potassium permanganate gave a 75% yield of hexafluoroacetone hydrate. The vapor pressure of hexafluoroacetone was measured between −60° and −28°C. (auth)

GRAPHITE

3086

APPROXIMATE METHOD OF EVALUATING LATTICE SUMS OF r^{-n} FOR GRAPHITE. A. D. Crowell (Amherst Coll., Massachusetts). J. Chem. Phys. 22, 1397-9(1954) Aug.

The graphite lattice is approximated by a set of planes in which the carbon atoms are assumed to be distributed with uniform density. It is shown that the lattice sums of r^{-n} taken over the graphite planes can then be expressed directly in terms of tabulated functions. The results of the approximation are compared with the results obtained by direct summation. (auth)

3087

LATTICE VIBRATION SPECIFIC HEAT OF GRAPHITE. Takeo Nagamiya (Osaka Univ., Japan) and Kozo Komatsu (Naniwa Univ., Osaka, Japan). J. Chem. Phys. 22, 1457-8 (1954) Aug.

3088

OXIDATION STUDIES OF SOME NATURAL GRAPHITES. R. A. Heindl and N. F. Mohler (National Bureau of Standards, Washington, D. C.). J. Am. Ceram. Soc. 38, 89-94(1955) Mar.

The rates of oxidation at 900°C were determined for twenty natural flake and amorphous graphites from eight foreign and three domestic deposits. Methods of determining moisture, volatile matter, ash, and graphitic carbon in such graphites are described. Numerical constants were established for the oxidation rates under specific conditions. In general, the oxidation rate of graphite was inversely related to particle size. The rate of oxidation of Madagascar graphite varied with the deposit from which the graphite originated. (auth)

LABORATORIES AND EQUIPMENT

3089 UCRL-2859

Radiation Lab., Univ. of Calif., Berkeley

FLEXIBLE TRANSFER TUBE FOR LIQUID HYDROGEN. R. C. Mathewson. Feb. 1, 1955. 6p. Contract W-7405-eng-48.

A flexible transfer tube has been developed in order to simplify transferring liquid H from dewar flasks of the nitrogen-cooled type. The tube is designed to remain attached to the apparatus. Diagrams are included. (M.P.G.)

3090

DISPOSABLE AIR FILTERS. Nucleonics 13, No. 3, 92-4 (1955) Mar.

A tabulation of disposable air filters is presented. Included in the table are the supplier's address, new filter cost, dimensions, rated flow, pressure drop at rated flow, efficiency, and construction. Additional firms are listed that supply filter media and other air-cleaning devices. (M.P.G.)

3091

PERFORMANCE OF WET DUST SCRUBBERS. C. E. Lapple and H. J. Kamack (E. I. du Pont de Nemours and Co., Wilmington, Del.). Chem. Eng. Progr. 51, 110-21(1955) Mar.

The various types of commercial equipment were surveyed to determine what were the basic contacting devices used in them. The devices selected for experimental evaluation and testing were simple enough so that the results of the tests could be applied to more complex devices. In all the tests aerosols were prepared by feeding dust at a uniform rate into a high-velocity air stream. The collection efficiency and pressure drop of various contacting devices when handling this dust-laden air were measured at various air flow rates, water flow rates, and dust loadings. Tests were first conducted on a laboratory scale and then repeated on a semiworks scale. The semiworks units were essentially geometrically similar to the laboratory units having 2.8 times the linear dimensions of the corresponding laboratory units. In one case (venturi contractor) data on a still larger unit were available for comparison. Various tests dusts were also used. The types of devices evaluated and the dusts used are summarized. In addition, exploratory tests were conducted to determine the effects on collection efficiency of using hot water and of injecting steam into the air stream. The laboratory and semiworks test equipment consisted in the order specified of an air meter, a dust feeder and disperser, a contacting device, a cyclone entrainment separator, and a bag filter in series. The bag filter was used for dust-loss measurements. In some runs the cyclone was used as the sole contacting device as well as the entrainment separator. (auth)

3092

MICROFORCEPS FOR HANDLING VERY SMALL SPECI-

MENS. William C. Shaw (Iowa State Coll., Ames). Rev. Sci. Instr. 26, 238(1955) Feb.

Design details are presented for a pneumatically controlled microforceps. The forceps have proved satisfactory for mounting single crystals of boron. (C.H.)

RADIATION CHEMISTRY

3093

SZILARD-CHALMERS REACTION ON CH$_3$I. Tor Brustad and Johan Baarli (Univ. of Oslo, Norway). J. Chem. Phys. 22, 1311-13(1954) Aug.

Studies on the "hot atom" reactions resulting from slow neutron irradiation of methyl iodide have been carried out. The results show that concentration of free iodine below 0.007 percent in CH$_2$I during irradiation has a great influence on the distribution of the 25-min I^{128} between CH$_3$I, CH$_2$I$_2$, and I$_2$. Comparison of experiments at temperatures below −55°C with carefully purified CH$_3$I indicates that the yield of the reactions in pure CH$_3$I is: CH$_3$I, 44.4%; CH$_2$I$_2$, 11.2%; and I$_2$, 44.2%. The influence of the temperature on this reaction shows that no change in yield has been found at the shift between liquid and solid state. Co^{60} rays at a rate of 2r per min at the side of sampling during neutron irradiation, do not change the distribution of the radioactive I^{128} between the compounds. (auth)

RADIATION EFFECTS

3094

NITROGEN FIXATION IN A NUCLEAR REACTOR. W. Primak and L. H. Fuchs (Argonne National Lab., Lemont, Ill.). Nucleonics 13, No. 3, 38-41(1955) Mar.

Under ionizing conditions, N and O react in the presence of water vapor to coat nitric-acid-susceptible metals. This reaction was studied in a reactor by determining the reaction product formed on nickel. Samples of Ni wire were sealed in ampules with atmospheres of dry or moist O,N, and air. The ampules were then irradiated in a reactor. Copious quantities of a light-green water-soluble salt were found on Ni wire after 30 Mw hr irradiation in humid air. The optical properties were found to correspond to those of a sample of commercial Ni(NO$_3$)$_2$ · 6H$_2$O. The initial rate of N fixation was computed to be 1.8×10^{12} atoms N/cm^3/sec. (M.P.G.)

3095

FLUORESCENCE AND THERMOLUMINESCENCE OF ICE. Leonard I. Grossweiner and Max S. Matheson (Argonne National Lab., Lemont, Ill.). J. Chem. Phys. 22, 1514-26 (1954) Sept.

Experiments on the x-ray excited fluorescence and thermoluminescence of pure ice and ice containing certain additives are described. The luminescent spectra are explained by a model in which the primary process in the radiative capture of electrons by impurity cations. The first-order buildup of fluorescence and temperature dependence of luminous intensity are interpreted by the breakdown and formation of the dipole sheath surrounding the dissolved ions. From this viewpoint, the activation energy for rotation of a sheath ice dipole from the normal lattice position to the aligned configuration is calculated to be 0.07 ev. The principal trap depth determined from the glow curve is 0.32 ev, a correction for the luminous efficiency being incorporated in the calculation; the corresponding s value is 2×10^8 sec^{-1}. Possible mechanisms for the first-order thermoluminescence are given. (auth)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3096

CYCLOPENTADIENYL COMPOUNDS OF Sc, Y, La, Ce AND SOME LANTHANIDE ELEMENTS. G. Wilkinson and J. M. Birmingham (Harvard Univ., Cambridge, Mass.). J. Am. Chem. Soc. 76, 6210(1954) Dec. 5.

SEPARATION PROCEDURES

3097 NAA-SR-863

North American Aviation, Inc.

REMOVAL OF DEUTERATED BORIC ACID FROM DEUTERIUM OXIDE SOLUTION BY ION EXCHANGE RESIN. L. Silverman and W. Bradshaw. June 15, 1954. 53p. Decl. Jan. 11, 1955. Contract AT-11-1-GEN-8.

The manner of addition of deuterated boric acid to deuterium oxide in prescribed increments and the analysis of the borated solution, after each boric acid increment, (used to correlate with the physical data obtained in the measurement of the transport mean free path of thermal neutrons in deuterium oxide) is described. An investigation to find a satisfactory method for removing the solute boric acid from the contaminated deuterium oxide showed that a highly basic anionic resin may be deuterated with high content (99%) deuterium oxide, the boric acid concentration may be reduced by ion exchange to 0.015 mg per liter and finally that the deuterium oxide withheld within an ion exchange column may be recovered. Analytical methods for the determination of deuterium oxide content, of boric acid in deuterium oxide, and for evaluating the resins used in this work were developed. (auth)

3098 WASH-512

Knolls Atomic Power Lab.

VISIT TO CHALK RIVER AS PART OF JOINT STUDY OF HIGHLY IRRADIATED PLUTONIUM, AEC [STAFF PAPER] 43/799. R. P. Schuman. Feb. 4, 1955. 9p. (Visit No. 316)

All detectable Pu was removed from samples of highly irradiated Pu. Samples of the the transplutonium elements from each irradiated specimen were dissolved in concentrated HCl, oxidized with NH$_4$NO$_2$ and HNO$_3$, and passed through a Dowex 1 column to further decontaminate them and to separate daughter activities. The solution was then evaporated, taken up in a minimum volume of very dilute HCl, and put on a resin column about 8 cm long and 0.8 cm diam. packed with graded Dowex 50, 12% cross linked. The column was operated at 87°C and eluted with 0.4 M ammonium lactate adjusted to a pH of 4.58 at a flow rate of 0.5 ml/cm^2 min. The elution was followed by α and β counting and where necessary further concentration and α pulse analysis. Elution curves are presented for Cf, Cf^{250}, Cf^{252}, Am, Am^{241}, Cm, Cm^{242}, Cm^{244}, and Bk^{249}. (C.H.)

3099

OSMOTIC BEHAVIOR OF ANION AND CATION EXCHANGERS. B. Soldano and Q. V. Larson (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1331-4(1955) Mar. 5.

The osmotic coefficients of both anion and cation exchangers are defined by a two parameter equation. The two parameters are found to be interdependent. By this approach the osmotic coefficients are related to the crystal radii of ions. (auth)

3100

THE OSMOTIC APPROACH TO ION-EXCHANGE EQUILIBRIUM. I. ANION EXCHANGERS. B. Soldano and D.

Chesnut (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1334-9(1955) Mar. 5

Anion exchange selectivities have been measured for the (Br–F), (Br–Cl) and (Br–I) systems both as a function of resin composition and degree of cross-linking. A method is proposed for the calculation of these selectivities as a function of the two aforementioned variables by means of osmotic coefficient measurements of weakly cross-linked anion exchangers. (auth)

3101

THE OSMOTIC APPROACH TO ION-EXCHANGE EQUILIBRIUM. II. CATION EXCHANGERS. B. Soldano, Q. V. Larson, and G. E. Myers (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1339-44(1955) Mar. 5.

Selectivities of cation exchangers were measured both as a function of resin cross-linking and composition. A general method is proposed to calculate cation-exchange selectivities from osmotic coefficient measurements of weakly cross-linked resins. (auth)

3102

ANION-EXCHANGE STUDIES. XV. SEPARATION OF PROTACTINIUM AND IRON BY ANION-EXCHANGE IN HCl–HF SOLUTIONS. Kurt A. Kraus and George E. Moore (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1383-4 (1955) Mar. 5.

3103

ANION EXCHANGE STUDIES. XVI. ADSORPTION FROM LITHIUM CHLORIDE SOLUTIONS. Kurt A. Kraus, Frederick Nelson, Francis B. Clough, and Richard C. Carlston (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1391(1955) Mar. 5.

3104

CONTINUOUS ION EXCHANGE WITH AN ENDLESS BELT OF PHOSPHORYLATED COTTON. C. H. Muendel and W. A. Selke (Columbia Univ., New York). Ind. Eng. Chem. 47, 374-9(1955) Mar.

The equilibrium in the system copper–sodium has been found to favor copper pickup. The effect of changes in the total normality of the liquid phase is small. Studies of the rate of exchange of phosphorylated cotton have shown that resistance to internal diffusion is the primary rate-limiting mechanism. In certain ranges of operation, liquid phase diffusion and rate of chemical reaction are also important. A continuous countercurrent ion exchanger was constructed and used to concentrate copper solutions with brine as the regenerant. The mass transfer coefficients found were lower than those that might be expected in view of the preliminary work, but are in the range of those reported by other workers using fluidized beds of resinous exchangers. Thus, it appears that continuous ion exchange with phosphorylated cotton can be carried out successfully. (auth)

3105

LIQUID EXTRACTION. Robert E. Treybal (New York Univ., N. Y.). Ind. Eng. Chem. 47, 536-46(1955) Mar.

This article reviews the literature on equilibrium studies, techniques and calculation methods, extraction equipment (design, flow capacity, mass transfer), and process applications (petroleum refining, fat and oil processing, pharmaceuticals, separation of metals, and miscellaneous applications. 244 references (L.T.W.)

3106

ION EXCHANGE. Robert Kunin and Frank McGarvey (Rohm and Haas Co., Philadelphia, Penna.). Ind. Eng. Chem. 47, 565-75(1955) Mar.

This review includes references on other reviews, theory, membranes, water softening, deionization, biochemical separations, recovery, purification, preparation, waste treatment, catalysis, and apparatus, processes, and miscellaneous applications. 475 references. (L.T.W.)

3107

STREAMING POTENTIAL STUDIES. QUARTZ FLOTATION WITH ANIONIC COLLECTORS. A. M. Gaudin and D. W. Fuerstenau (Massachusetts Inst. of Tech., Cambridge). Mining Eng. 7, 66-72(1955) Jan.

By means of streaming potential studies the Gouy and Stern concepts of the electrical double layer have been applied to the flotation of quartz. From this work the following conclusions can be drawn: quartz is negatively charged in pure water; hydroxyl and hydrogen ions appear to function as potential-determining ions in water; since pH determines the total double layer potential of quartz, the pH of the solution will affect the adsorption of all other ions by quartz; sodium ions function as surface-inactive counter ions; barium ions and aluminum ions function as counter ions and also are attracted to the surface by chemical forces; in the absence of an activator, the only effect of adding sodium laurate or sodium oleate to the system is to compress the double layer. In the presence of an activator, laurate ions are associated with chemi-sorbed barium ions at the Stern layer. (auth)

3108

CHROMATOGRAPHY ON PAPER IMPREGNATED WITH ION EXCHANGE RESINS. A PRELIMINARY REPORT. M. Lederer (Institut du Radium, Paris, France). Anal. Chim. Acta 12, 142-4(1955) Feb.

Ion exchange papers were prepared by dipping paper in suspensions of colloidal resin aggregates. The papers were used for the separation of rare earths, partition chromatography, and the study of the elution sequence of some transition metals. (auth)

3109

ANION EXCHANGE SEPARATION OF TIN, ANTIMONY AND TELLURIUM. Gilbert W. Smith and S. A. Reynolds (Oak Ridge National Lab., Tenn.). Anal. Chim. Acta 12, 151-3 (1955) Feb.

Tracer quantities of Sn^{+4}, Sb^{+5}, and Te^{+4} are separated on Dowex-1 anion-exchange resin in 0.1M oxalic acid followed by 1M sulfuric acid. (auth)

3110

THE PARTITION OF HNO$_3$ BETWEEN WATER AND THREE ORGANIC SOLVENTS. J. Kooi (Joint Establishment for Nuclear Energy Research, Kjeller, Norway). Rec. trav. chim. 74, 137-42(1955) Feb.

The partition of nitric acid between water and diethylether, methylisobutyl ketone, and dibutyl carbitol respectively has been measured at 25.0 ± 0.1°C in the range from 1 to 10N. The experimental data are presented as mass and as concentration (mol/l) partition coefficients. The results seem to be accurate to within 1%. (auth)

SORPTION PHENOMENA

3111 NYO-6263

Massachusetts Inst. of Tech.

THE ADAPTATION OF NEW RESEARCH TECHNIQUES TO MINERAL ENGINEERING PROBLEMS. Jan. 31, 1955. 59p. Contract AT(30-1)-956. (MITS-26)

Measurements of adsorption of Ag$^+$ and I$^-$ on AgI in the presence and absence of lauric acid were made at pH 9 and at a sodium borate concentration of 4×10^{-3}. Adsorption of potential determining ions of Ag_2S was determined at pH 4.68. The adsorption characteristics of flotation agents in PbS were studied. The adsorption of Na and chloride ions on quartz, the adsorption of Cu and Pb on sphalerite and Cu desorption by NaCN, and the adsorption and desorption of Ag on sphalerite are presented. Use of solvent extraction for separating different metal ions is discussed. Adsorption of mercaptan at the Ag—air and Ag—liquid interfaces, solubilities of metal xanthates, preparation of Co glass beads, and grinding tests in a vibratory ball mill are discussed. (For preceding period see NYO-6262.) (J.E.D.)

3112

SORPTION OF GASES ON EVAPORATED NICKEL FILMS. I. SORPTION OF OXYGEN. Zenjiro Oda. Bull. Chem. Soc. Japan 27, 465-9(1954) Oct.

3113

REVERSIBILITY IN PHYSICAL ADSORPTION. E. L. Pace, K. S. Dennis, S. A. Greene, and E. L. Heric (Western Reserve Univ., Cleveland, Ohio). Can. J. Chem. 33, 245-50 (1955) Feb.

The question of reversibility and equilibrium is considered in relation to the physical adsorption of gases on finely divided solid surfaces. Conclusions are drawn from calorimetric measurements of (1) adsorption isotherms, (2) integral, differential, and isosteric heats of adsorption, and (3) heat capacity of the adsorbed phase for surface coverages of the order of a monolayer or less. In line with the preceding, results are presented and discussed for calorimetric studies involving (1) heat of adsorption and heat capacities of methane adsorbed on rutile between 80 and 140°K, (2) heats of adsorption of argon on rutile between 60 and 90°K, and (3) the zero point entropy of krypton adsorbed on rutile at a coverage of about 0.57 of the monolayer capacity. (auth)

3114

ADSORPTION. B. L. Harris. Ind. Eng. Chem. 47, 508-17 (1955) Mar.

A review is presented of the available literature on industrial applications of adsorption, surface area and porosity studies, chromatography, liquid-phase adsorption, chemisorption, general theories, preparation and properties of various adsorbents, and thermochemistry of adsorption. An extensive bibliography is presented. (L.T.W.)

SPECTROSCOPY

3115 RIA-54-849

Rock Island Arsenal Lab.

[PROLONGATION OF SERVICE AND STORAGE LIFE OF ORDNANCE RUBBER COMPONENTS]. REPORT NO. 11. INFRARED SPECTROSCOPY OF POLYMERS: A LITERATURE REVIEW. Roland Freeman. Mar. 3, 1954. 19p.

A review of available literature pertaining to infrared studies of polymers led to the conclusion that infrared spectrographic techniques can be applied to identification and determination of the molecular structure of polymers and serve as a means for estimating the deterioration of polymers. 31 references. (C.H.)

3116

SILVER-ACTIVATED ALKALI HALIDES. H. W. Etzel and J. H. Schulman (Naval Research Lab., Washington, D. C.). J. Chem. Phys. 22, 1549-54) Sept. (cf. NSA 6-3007)

The emission, excitation, and absorption spectra of silver-activated alkali halides have been investigated. Three absorption bands due to ionic silver have been observed in NaCl, NaBr, KCl, and KBr, and the growth of these bands with silver concentration has been studied. In each of these crystals the two shorter-wave-length bands are ascribed to isolated silver ions, while the band of longest wavelength is ascribed to pairs of silver ions. Upon x-ray irradiation as many as five new absorption bands arise in certain alkali halides in addition to the F band. Excitation into three of these bands (designated as the B, C, and D bands) produces luminescence, the emission spectrum being different for each band. The B band is attributed to a center consisting of an electron trapped at a silver ion adjacent to a halogen-ion vacancy; the C band to an electron trapped at a complex of two silver ions adjacent to a halogen-ion vacancy; and the D band to a hole trapped at an alkali-ion vacancy adjacent to a silver ion. (auth)

SYNTHESES

3117 NBS-3845

National Bureau of Standards

MACRO METHODS FOR REDUCING ALDONIC LACTONES TO SUGARS. THE PREPARATION OF L-GLUCOSE-1-C^{14}. Harriet L. Frush and Horace S. Isbell. Dec. 31, 1954. 10p.

Two macro procedures are described for the efficient reduction of lactones of aldonic acids by sodium amalgam in the presence of an oxalate buffer. One employs a stainless steel flask equipped with a stirrer that sweeps the bottom of the flask, the other a high-speed blender. Either method is suitable for the preparation of rare sugars in relatively large quantities. By the procedures described, L-glucose has been prepared from L-glucono-δ-lactone in 88 percent yield. This paper also reports the preparation of L-glucose-1-C^{14} from L-arabinose on a semimicro scale. (auth)

URANIUM AND URANIUM COMPOUNDS

3118 BMI-982

Battelle Memorial Inst.

REACTION OF HYDROGEN WITH URANIUM. W. M. Albrecht and M. W. Mallett. Feb. 17, 1955. 21p. Contract W-7405-eng-92.

The reaction of hydrogen with uranium was studied in the temperature range 96 to 400°C at pressure levels of $p-p_0$ equal to 430, 150, and 70 mm of mercury (where p is system pressure and p_0 is the plateau dissociation pressure of the uranium hydride product). Reaction rates followed the linear law. At the pressure investigated, the linear rate constant increased with increasing temperature in the range 96 to about 250°C and decreased with increasing temperature from about 250 to 400°C. The variation of temperature and pressure with the linear rate constant in the range 96 to about 250°C is given by the equation: $k = 4.11 \times 10^{-3} (p-p_0)^{3/4} \exp(-1820/RT)$. where k is in units of ml per cm^2 per sec and $p-p_0$ is in units of mm of mercury. Two different initial reactions were obtained. One in the range 96 to about 250° at $p-p_0$ of 70 and 150 mm of mercury and 96 to 400°C at $p-p_0$ of 430 mm of mercury showed a gradual increase in the rate of hydrogen consumption until the rate became linear. The other initial reaction followed the parabolic rate law in the range of about 250 to 400°C at $p-p_0$ of 70 and 150 mm of mercury. Adsorption plays an important role in the over-all reaction mechanism of uranium with hydrogen. In the range 96 to about 250°C, the rate of adsorption is faster than the rate of reaction to form hydride, but it is of the same order of magnitude. Therefore, formation of hydride is the rate-determining step. However, in the range of about 250 to 400°C the rate of adsorption is probably the rate-controlling step, with the exception of the initial parabolic reaction which would be diffusion controlled. (auth)

3119

ON THE SULFIDES OF URANIUM. Marius Picon and Jean Flahaut. Compt. rend. 240, 535-8(1955) Jan. 31. (In French)

US_2 is found to yield a compound U_3S_5 at 1530°C. In the presence of Al at 1325°, U_2S_3 is formed. A study of the effect of heat on US_2 gives new information on its dissociation. (tr-auth)

WASTE DISPOSAL

3120 BNL-323

Brookhaven National Lab.

PROGRESS REPORT ON WASTE DEVELOPMENT PROJECT. DESCRIPTION OF CALCINER PILOT PLANT. F. Hittman and B. Manowitz. Dec. 1954. 14p.

The work of the Waste Processing Development Project at Brookhaven National Laboratory has led to the development of a piece of equipment capable of substantially reducing the volume of simulated high-activity aqueous waste streams. This equipment, known as a continuous calciner, is a heated tube, auger-agitated concentrator which dehydrates and fuses the various aqueous waste salt solutions to an anhydrous free-flowing melt on a continuous basis. Both a laboratory model and a pilot plant model of this equipment have been operated successfully. The pilot plant model has been operated without major difficulties for 150 hours and has produced approximately 1500 pounds of fused salt product. During this period of operation, a decontamination factor of approximately 500 was achieved. The corrosion rates of mild and stainless steel in the fused salt product are being studied, and preliminary results are presented in this report. (For preceding period see BNL-293.) (C.H.)

ENGINEERING

3121 KAPL-1161

Knolls Atomic Power Lab.

CONTROL ROD GAS SEALS. W. A. Heywood. Jan. 25, 1955. 127p. Contract W-31-109-Eng-52.

The experimental work to develop a seal with a He leak rate of less than 2×10^{-6} cc/min is described, and the mechanism controlling the lower leak rate limit for elastomer seals is demonstrated. A seal which utilizes a liquid metal as the gas sealant is described. He leak rates for such a seal with a 25-psi pressure differential are about 10^{-7} cc/min, the friction torque about 4 to 20 in-lb, and the life is greater than 20 million cycles of rotary oscillatory motion. (auth)

3122 KLX-1395

Vitro Corp. of America

MTR RODS AS FISSION PRODUCT SOURCES FOR INDUSTRIAL STERILIZATION. ENGINEERING FEASIBILITY STUDY AND COST ESTIMATE. JOB 24. Jan. 2, 1954. Decl. Feb. 15, 1955. 33p. Contract AT(30-1)-850.

Three pilot plant designs for industrial sterilization plants employing fission-product sources such as spent MTR fuel elements are presented. Features are incorporated in these designs which are apt to be encountered in future industrial installations employing fission products as radiation sources for the sterilization of foods, drugs, and similar materials. Data on cost of production of radiation sources from MTR fuel rods are tabulated. (See also KL-X-24-12-N.) (C.H.)

3123 PRL-5.13

Petroleum Refining Lab., Pennsylvania State Univ. Coll. of Chemistry and Physics

FLUIDS, LUBRICANTS, FUELS, AND RELATED MATERIALS. QUARTERLY REPORT FOR OCTOBER, NOVEMBER, AND DECEMBER 1954. Jan. 28, 1955. 82p. Contract AF33(038)-18193.

3124

STRESSES IN A METAL TUBE UNDER BOTH HIGH TEMPERATURE VARIATION AND INTERNAL PRESSURE. J. H. Faupel. J. Appl. Mechanics 22, 136-7(1955) Mar.

In a paper by C. C. Chang and W. H. Chu published in the June, 1954, issue of J. Appl. Mechanics, a system is worked out for calculating stresses in tubes subjected simultaneously to thermal gradients and internal pressure. In the present paper a procedure is suggested which would simplify the mathematics and provide answers within 15 to 20% of the actual values for the initial yield and final burst quantities. Comments on the procedure are presented by the authors of the original paper. It is felt by them that the proposed method of calculation is difficult to justify in cases of high temperature gradient. (M.P.G.)

HEAT TRANSFER AND FLUID FLOW

3125 NACA-TN-3336

Lewis Flight Propulsion Lab., NACA

REVIEW OF EXPERIMENTAL INVESTIGATIONS OF LIQUID-METAL HEAT TRANSFER. Bernard Lubarsky and Samuel J. Kaufman. [Nov. 4, 1954]. 115p.

Experimental data of various investigators of liquid-metal heat-transfer characteristics were reevaluated using as consistent assumptions and methods as possible and then compared with each other and with theoretical results. The reevaluated data for both local fully developed and average Nusselt numbers in the turbulent flow region were found still to have considerable spread, with the bulk of the data being lower than predicted by existing analysis. An equation based on empirical grounds which represents most of the fully developed heat-transfer data is $N = 0.625\ Pe^{0.4}$ where Nu represents the Nusselt number and Pe the Peclet number. The theoretical prediction of the heat transfer in the entrance region was found to give lower values, in most cases, than those found in the experimental work. (auth)

3126 NAVORD-2958

Naval Ordnance Lab.

A REVIEW OF INVESTIGATIONS ON TURBULENT FLOW WITH HEAT TRANSFER AT SMOOTH WALLS. Phrixos J Theodorides. Nov. 4, 1953. 81p. (AD-34999)

A study of turbulent flow with heat transfer at smooth walls is presented. Characteristics are discussed for the flow in prismatic ducts with symmetric cross sections, closed and open, as well as in the boundary layer of a flat plate. (J.E.D.)

3127 AEC-tr-2094

CRITERION FOR THE INCIDENCE OF BREAK-AWAY CAVITATION ON A CYLINDRICAL PROFILE. K. K. Shal'nev. Translated by E. R. Hope from Doklady Akad. Nauk 61, 799-802(1948). 7p. (AEC-tr-2094)

In cavitation calculations for hydraulic machinery, a requirement is to determine the danger of cavitation developing on any component of the machine, given the distribution of pressures on the said component. Results are presented of research on a criterion for the incidence of cavitation of the break-away type in the region of break-away flow behind a cylinder. (auth)

3128 AEC-tr-2096

SHAPES OF THE CAVITATION REGION ON A TRANSVERSE FOIL IN A NORMALLY INCIDENT STREAM. K. K. Shal'nev. Translated by E. R. Hope from Doklady Akad. Nauk 94, 1017-22(1954) 7p. (AEC-tr-2096)

The conditions of formation of cavitation behind a foil placed normally to the flow axis are identical with the conditions of cavitation back of a circular profile. In a plane-parallel stream with a positive gradient or pressure, the shape of the cavitation hollow agrees only in the initial stages with the theoretical notion that the boundary of the cavitation region has a unidirectional curvature, and in the more developed stages, only in that part of the boundary line closest to the foil. In the extremely developed cavitation stages, the fact that the part of the surface which closes off the cavitation hollow breaks up into cavitating streams rules out the possibility of a counterflow of the boundary stream toward the hind side of the foil. In the cavitation region the mean pressure is not the same at all points; it depends on the structure of this region and, consequently, on the stage of cavitation. The pressure in the cavitation region is equal to the vapor pressure of water only in the gaseous zone of that region. (auth)

3129 ATI-153687

THE MAXIMUM AND MINIMUM VALUES OF HEAT Q TRANSMITTED FROM METAL SURFACE TO BOILING WATER UNDER ATMOSPHERIC PRESSURE. Shiro Nukiyama. Translated by H. Miyamoto from J. Soc. Mech. Engrs. Japan 37, 367-74; 553(1934). 15p. (F-TS-713-RE)

3130 RAE-Trans-476

THE MEASUREMENT OF THE VELOCITY OF A GAS FLOW WITH THE HOT-WIRE ANEMOMETER. (Messung Der Strömungsgeschwindigkeit Von Gasen Mit Dem Hitzdraht-Anemometer). Ulrich Jacob. Translated by W. Pinsker from Arch. tech. Messen, 1-2; 25-8(1954). 14p. (AD-44536)

The principles of the hot-wire method for the measurement of flow-velocities and flow directions are discussed and the method is compared with other anemometers. A number of instruments are described and various techniques for the compensation and suppression of errors and for the improvement of sensitivity of the measurement are discussed. The performance of instruments using thermocouples and application of the hot wire technique to turbulence measurements are discussed. 24 references. (C.H.)

3131

FLUID MECHANICS STUDIES. TRANSITION PHENOMENA IN PIPES AND ANNULAR CROSS SECTIONS. R. S. Prengle and R. R. Rothfus (Carnegie Inst. of Tech., Pittsburgh, Penna.). Ind. Eng. Chem. 47, 379-86(1955) Mar.

Characteristics of laminar-turbulent transitions in passages having a practical level of disturbance at their entrances are investigated. The transition flow of water in three pipes and five annuli was studied by observing the behavior of injected dye filaments. Explorations of the fluid sections show that the first observable departure from laminar behavior occurs at the point of maximum local velocity in every case. Both the start of sinuous motion and the casting off of the first true disturbance eddy take place at characteristic but different values of the Reynolds number for pipes and annuli. Laminar film thickness can be correlated in each type of cross section. An equation is presented that describes the laminar film thickness in pipes over a considerable range of transition and turbulent Reynolds numbers. The data are significant for the prediction of heat and mass transfer rates in process equipment operated in the transition and lower turbulent flow range. The results also bear directly on the general problem of turbulent momentum exchange in circular and noncircular cross sections. (auth)

3132

METAL-FILM RESISTANCE THERMOMETERS FOR MEASURING SURFACE TEMPERATURES. C. C. Winding, L. Topper, and B. V. Baus (Cornell Univ., Ithaca, N. Y.). Ind. Eng. Chem. 47, 386-92(1955) Mar.

A novel method for measuring the surface temperature of solids is described. A thin (less than 1000 A) uniform film of a metal such as chromium or nickel, deposited by vacuum evaporation on a nonconducting substrate, such as glass or quartz, is used as a resistance thermometer. The film has a negligible thermal resistance and capacity; thus, the measured temperature should be identical with that of the fluid-solid interface. There is no disturbance of the flow of heat or fluid over the coated tube. The effect of thickness and composition on the electrical properties of the films was studied. This temperature measuring technique was applied to the measurement of film coefficients for the condensation of 14 organic vapors on the outer surface of a horizontal glass tube. Many other applications, such as the determination of thermal conductivities of solids, are possible. (auth)

3133

HEAT TRANSFER DESIGN DATA. INCLINED FALLING FILMS. Leo Garwin and Emerson W. Kelly, Jr. (Oklahoma A. and M. Coll., Stillwater). Ind. Eng. Chem. 47, 392-5 (1955) Mar.

The effect of the angle of inclination on the liquid film heat transfer coefficient is discussed. Water in turbulent flow down a flat, inclined plate was heated by steam. The angle of inclination with respect to the horizontal was varied from 9 to 90°. Flow rates covered the range 1850 to 10,100 lb/ft of breadth, with corresponding Reynolds numbers of 2900 to 12,800. Coefficients ranged from 820 to 1910 $\text{Btu/hr/ft}^2/{}^\circ\text{F}$. They were found to vary as the $^1/_3$ power of the mass flow rate per unit breadth, and as the 0.2 power of the sine of the angle of inclination. The data showed an average deviation of 7% and a maximum deviation of 17% from the correlating equation. The equation is consistent with the general turbulent film heat transfer equation of McAdams and with some recent film thickness measurements of Dukler and Bergelin. It supports the extension of the Fanning friction factor equation to the flow of liquid films in the turbulent range. It should now be possible to design more accurately heat transfer equipment of the inclined falling film type. (auth)

3134

FLOW OF FLUIDS. Murray Weintraub (U.S. Bureau of Mines, Pittsburgh, Penna.). Ind. Eng. Chem. 47, 558-65 (1955) Mar.

This review includes references on single-phase flow (Newtonian flow, non-Newtonian and unsteady-state flow, and metering and control), flow through porous media, and multiphase flow (gas-solid systems, flow through liquid-liquid, liquid-gas, and gas-gas contactors, and mechanical design). 159 references. (L.T.W.)

3135

MOLECULAR TRANSPORT PROPERTIES OF FLUIDS. Ernest F. Johnson (Princeton Univ., N. J.). Ind. Eng. Chem. 47, 599-604(1955) Mar.

This review briefly describes some of the important experimental and theoretical work on the molecular transport properties of single-phase fluids which has been reported during the past year. With the exception of a few foreign articles and three domestic reports only publications appearing in 1954 have been included. Viscosity, thermal conductivity, ordinary diffusivity, and thermal diffusivity are treated, following a discussion of general papers. 91 references. (L.T.W.)

3136

FLUID DYNAMICS. A. K. Oppenheim (Univ. of California, Berkeley) and R. R. Hughes (Shell Development Co., Emeryville, Calif.). Ind. Eng. Chem. 47, 632-47(1955) Mar.

This review includes references on fluid properties, viscous flow, transition regime, turbulent flow, vortex flow and rotation, boundary layer, pipe flow, jets, multiphase flow, gas dynamics, and dynamics of combustion. 182 references. (L.T.W.)

3137

HEAT TRANSFER. E. R. G. Eckert, J. P. Hartnett, and H. S. Isbin (Univ. of Minnesota, Minneapolis). Ind. Eng. Chem. 47, 647-58(1955) Mar.

A review of the literature on heat transfer is presented. 194 references. (L.T.W.)

3138

CALCULATION OF FINSIDE COEFFICIENTS IN LONGITUDINAL FINNED-TUBE EXCHANGERS. Loyal Clarke and R. E. Winston (Day and Zimmermann, Inc., Philadelphia). Chem. Eng. Progr. 51, 147-50(1955) Mar.

Necessary modifications of the turbulent flow and streamline flow equations by Siedor and Tate (Ind. Eng. Chem. 28, 1429(1936) due to diameter differences in the calculation of finside film coefficients of heat transfer in longitudinal finned-tube exchangers are presented. Curves for the estimation of film coefficients of heat transfer and correlation of film coefficients of heat transfer in narrow annuli and finned-tube shells are given. Data on cut and twist exchangers operating in the streamline range and on the more common sizes of commercial double-pipe exchangers in which the center pipe has external-longitudinal fins are tabulated. (J.A.G.)

3139

A SELECTION OF GRAPHS FOR USE IN CALCULATIONS OF COMPRESSIBLE AIRFLOW. Oxford, England, The Clarendon Press, 1954. 115p.

MATERIALS TESTING

3140 AD-42776

Detroit Univ.

STRESS RELAXATION OF GASKET MATERIALS AND EVALUATION OF A TEST FIXTURE. L. S. Kowalczyk. 1954. 146p. For Detroit Arsenal. Contract DA-20-089-ORD-36608.

The determination of stress relaxation of various nonmetallic gaskets ranging in hardness from cork to compressed asbestos using a Farnam-Cole relaxometer was made. The relaxometer was found to yield reproducible results with specimens processed under various conditions and to be applicable to all nonmetallic gasket materials. (J.E.D.)

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

3141

THE SYSTEMS ZIRCONIA–LANTHANA AND ZIRCONIA–NEODYMIA. Frank H. Brown, Jr. and Pol Duwez (California Inst. of Tech., Pasadena). J. Am. Ceram. Soc. 38, 95-101(1955) Mar.

The minimum amounts of lanthana and neodymia required to stabilize zirconia into a cubic form are 30 and 20 mole %, respectively, at 980°C. X-ray diffraction studies have established the upper limit of the two cubic solid solution regions as approximately 40 mole %. This stabilized region of the phase diagrams broadens slightly in each system as the temperature of heat treatment is raised. Based on experimental evidence obtained by x-ray diffraction and dilatometric methods, phase diagrams for the systems zirconia–neodymia are proposed. (auth)

3142

PHASE EQUILIBRIA IN THE SYSTEM $BaO-TiO_2$. D. E. Rase and Rustum Roy (Pennsylvania State Univ., State College). J. Am. Ceram. Soc. 38, 102-13(1955) Mar.

The system $BaO-TiO_2$ was investigated using quenching, strip-furnance, and thermal techniques. Five compounds were found to exist in the system: Ba_2TiO_4, $BaTiO_3$, $BaTi_2O_5$, $BaTi_3O_7$, and $BaTi_4O_9$. Of these, only barium metatitanate ($BaTiO_3$) melts congruently (at 1618°C). The dititanate melts incongruently at 1322°C to yield $BaTiO_3$ and liquid; the trititanate melts at 1357°C to yield $BaTi_4O_9$ and liquid; the tetratitanate melts to TiO_2 and liquid at 1428°C. The nature of melting of the orthotitanate could not be determined accurately because of the high temperature involved and the rapid reaction with platinum. The two eutectics in the system occur between Ba_2TiO_4, and $BaTiO_3$ at 1563°C and between $BaTi_2O_5$ and $BaTi_3O_7$ at 1317°C. The temperature of the cubic-hexagonal transition in barium metatitanate was determined as 1460°C, and the transition has been shown to be reversible. The transition temperature is raised sharply by the addition of a small percentage of TiO_2 although the extent of solid solution is quite limited. Some applications to the manufacture of titanate bodies and to the growth of single crystals of barium metatitanate are discussed. (auth)

CORROSION

3143 AECU-3000

Institute for the Study of Rate Processes, Univ. of Utah

CORROSION OF ZIRCONIUM. I. SURFACE AREA DETERMINATION AND SAMPLE PREPARATION STUDY. PART A. CHEMICAL PROPERTIES OF ZIRCONIUM.

PART B. DETERMINATION OF SURFACE AREA CHANGES ON ZIRCONIUM SAMPLES. PART C. INVESTIGATION OF ELECTRO-REDUCTION TECHNIQUE FOR DETERMINING THE CORROSION RATE OF ZIRCONIUM. TECHNICAL REPORT XV. A. Burtron Johnson and George Richard Hill. Dec. 1, 1954. 15p. Contract AT(11-1)-82.

A study of the chemical properties of Zr indicates that the most satisfactory etchant for removal of films from Zr surfaces is a solution of 3 to 10% HF and 30% HNO_3 in water. Preliminary measurements indicate that the electrolytic method for measuring surfaces areas can be used for Zr samples. Preliminary investigations of the electroreduction technique for determining corrosion rate of Zr are reported. (J.E.D.)

3144 AECU-3002
Institute for the Study of Rate Processes, Univ. of Utah
CORROSION OF ZIRCONIUM. II. A REACTION RATE STUDY OF THE SOLUTION OF HAFNIUM-FREE ZIRCONIUM IN HYDROFLUORIC ACID SOLUTIONS. TECHNICAL REPORT NO. XVI. Tennyson Smith and George Richard Hill. Nov. 30, 1954. 52p. Contract AT(11-1)-82.

The rate of solution of Zr in HF solutions is being studied using a radioactive tracer Zr^{95}. By an appropriately designed system, continuous records of the rate are possible. The rate has proven to be dependent on the HF concentration except at low H^+ concentrations—this is being investigated further. Four possible mechanisms for the slow step in the reaction are suggested, two of which are considered to be more likely. Further work will allow differentiation between these two. They were the adsorption of HF free acid on the surface and the reaction of Zirconium with HF adsorbed, with some substance adsorbed on the surface, probably O_2. The products of the reactions were shown to be mostly ZrF_3^+ ion in solution and H_2 and N_2O in the gas phase depending on whether HCl or HNO_3 was in solution with HF. Oxygen was also detected as a gaseous product. An Arrhenius plot yielded an activation energy of 4.0 kilocalories per mole for the rate determining step. For preceding report in series see AECU-3000.) (auth)

3145 EES-040038F(3)
Naval Engineering Experiment Station, Annapolis
INVESTIGATION OF CRACKING IN STAINLESS STEEL AUXILIARY BOILERS FOR AM 421 CLASS MINE SWEEPERS. W. Lee Williams. Apr. 5, 1954. 30p.

Parts of three low-pressure stainless steel boilers were examined after having been steamed approximately 1,000 hr. All of the boilers had developed stress-corrosion cracks. The cracks originated from the waterside in crevices near welds. The problem was discussed in relation to stress-corrosion data obtained in another Station investigation. (auth)

3146 NP-5562
Research Foundation, Ohio State Univ.
THE PROPERTIES OF OXIDATION RESISTANT SCALES FORMED ON MOLYBDENUM-BASE ALLOYS AT ELEVATED TEMPERATURES. TECHNICAL REPORT NO. 467-3. M. Gleiser, W. L. Larsen, R. Speiser, and J. W. Spretnak. Feb. 1955. 50p. Contract N6onr-22528.

Due to the limitations of externally applied claddings for protecting molybdenum-base alloys from oxidation at elevated temperatures, a program of developing protective self-regenerative scales on molybdenum-base alloys was conducted. Various molybdates and molybdenum-containing oxide complexes were tested for stability at elevated temperatures in order to ascertain if they would be stable at operating temperatures, and thus possibly present a barrier to further oxidation. Nickel and cobalt molybdates appeared promising and were further studied in terms of their properties and their ability to form as protective scales upon molybdenum alloys containing them. Results of oxidation tests show that molybdate scales will form on molybdenum—nickel and molybdenum—cobalt alloys and are protective. Both nickel and cobalt molybdates spall upon thermal cycling. Spalling can be suppressed by the addition of certain third components which stabilize the molybdate crystal structure. The nature and suppression of spalling are discussed. 24 references. (auth)

3147 AEC-tr-2095
EFFECT OF SLOT-STREAMS ON INTENSITY OF CAVITATION CORROSION. K. K. Shal'nev. Translated by E. R. Hope from Doklady Adad. Nauk 91, 1043-5(1953). 6p. (AEC-tr-2095)

The slot stream flowing through a gap between a channel wall and the end of a model, under the influence of the different pressures on the front and hind sides of the model, may serve as a means of hydraulic protection from the corroding action of the cavitation developed on the model. The conditions for development of the anticorrosive protective action of the slot stream are that the slot does not clog up, and that its height is equal to 1/20th to 1/15th of the thickness of the cavitation layer. Cavitation damage to the rotor-chamber walls of axial-flow turbines and pumps, as actually encountered in practice, cannot be explained by the direct action of the cavitations developed on the rotor blades. According to the present research, the slot stream through the clearance gap between the blades and the chamber walls should protect the walls from the corroding action of cavitation on the blades of hydraulic machinery. (auth)

3148 AEC-tr-2097
RESISTANCE OF METALS TO CAVITATION CORROSION IN FRESH WATER AND SEA WATER. K. K. Shal'nev. Translated by E. R. Hope from Doklady Akad. Nauk 95, 229-32(1954) 8p. (AEC-tr-2097)

A comparison was made of the resistance of metals to cavitation corrosion in fresh water and sea water. The resistance of metals to corrosion was determined by the vibrator method with magnetostriction apparatus. The mechanical properties and resistance to cavitation corrosion of brass, bronze, and gray cast iron are tabulated. (J.E.D.)

3149

MINIMIZING STRESS CORROSION CRACKING OF CYLINDER VALVES. M. Schussler (Carbide and Carbon Chemicals Co., Oak Ridge, Tenn.). Corrosion 11, No. 3, 19-22 (1955) Mar.

This investigation covers the diagnosis of the cause of splitting of aluminum bronze bonnets on valves for cylinders for handling corrosive gases and the remedial steps taken to minimize the failures. The splits in the bonnets were found to be due to stress corrosion cracking which was induced by excessive torque applied to the bonnet, by a design weakness in bonnet itself and by the presence of longitudinal stringers of eutectoid in the material. Laboratory tests showed that design changes could be made to strengthen the bonnets and that the stringers could be eliminated by heat treatment. The combination of heat treated bonnets along with controlling torque applied to the bonnet nuts, eliminated bonnet failures in the valves. Improvements in bonnet design were incorporated in a new design for valves. (auth)

3150

METALLIZING FOR CORROSION PREVENTION. A. P. Shepard and R. J. McWaters (Metallizing Engineering Co., Inc., Westbury, N. Y.). Corrosion 11, No. 3, 29-32(1955) Mar.

Problems and techniques connected with the spraying of molten metal on iron and steel to prevent corrosion are surveyed, including surface preparation, bonding coat, organic sealers and the relative merits of the various metals sprayed. Characteristics of zinc and aluminum coatings are discussed and recommendations are made for selection vs. environment anticipated. A list of recommendations for specific applications includes ship's hulls, oil tanker interiors, fresh water tanks, marine atmospheric exposures, railroad bridges, steel piling, industrial atmospheres, exhaust stacks and mufflers and river lock gates. (auth)

3151

GALVANIC CORROSION BEHAVIOR OF TITANIUM AND ZIRCONIUM IN SULFURIC ACID SOLUTIONS. David Schlain, Charles B. Kenahan, and Doris V. Steele (U. S. Bureau of Mines, College Park, Md.). J. Electrochem. Soc. 102, 102-9(1955) Mar.

Aluminum alloys are the anodic members of titanium—aluminum alloy couples in dilute sulfuric acid solutions in the presence of air. In stronger acid solutions, particularly when air is absent, aluminum alloys are anodic only at the beginning of the immersion period. After an induction period titanium becomes anodic. Aluminum alloys are always anodic in zirconium—aluminum alloy couples immersed in sulfuric acid solutions. The rate of galvanic attack increases with the supply of air. The direction of flow of the galvanic current is always in agreement with the relative values for the electrode potentials of the single metal specimens. Little, if any, galvanic corrosion occurs in couples of titanium or zirconium with stainless steel, although there are generally sizeable differences of potential between single specimens of these metals. In solutions in which single specimens of titanium are inert and cathodic with respect to aluminum alloys, contact with these alloys may cause titanium to corrode. This is attributed to activation of titanium surfaces by the hydrogen evolved. Contact with stainless steel in solutions in which titanium is the anodic member of the couple results in marked decreases in corrosion rates of titanium because of anodic polarization of titanium surfaces. (auth)

3152

GEOMETRIC FACTORS IN ELECTRICAL MEASUREMENTS RELATING TO CORROSION AND ITS PREVENTION. W. J. Schwerdtfeger and Irving A. Denison. J. Research Natl. Bur. Standards 54, 61-71(1955) Feb.

The "electrical boundary" of a galvanic couple immersed in an aqueous medium, when corroding normally and also when corrosion is stopped by cathodic protection, is discussed in the light of present theory. Experimental data, consisting of potential measurements made on bimetallic couples in an unrestricted medium producing relatively little polarization and also one producing considerable polarization, are compared with theoretical data. The electrical boundary is theoretically defined and experimentally verified for model galvanic couples having bimetallic electrodes, one couple simulating line electrodes and the others having electrodes made of longitudinal cylindrical segments arranged in three anode-to-cathode area ratios. The effect on potential measurements as a result of interference to the normal flow of galvanic and external currents is also shown by experimental data. The results of this study indicate that geometric factors should be given consideration in making potential measurements on subsurface structures of similar configuration, such as cylindrical tanks and pipelines. (auth)

GEOLOGY AND MINERALOGY

3153 AD-43739

Fordham Univ.

BETA RAY IONIZATION FROM THE GROUND. SCIENTIFIC REPORT NO. 4. V. F. Hess, W. D. Parkinson, and H. A. Miranda. Dec. 1953. 49p. Contract AF19(122)-409.

A method for measuring β-ray ionization in the field with portable ionization chambers is described. The method is new, and so is described in some detail. Results of measurements at sixteen locations in and around New York City are presented. These results are compared with the expected ionization computed from a knowledge of the average amounts of radioactive elements found in typical rocks, and the recently determined Eve's constants for these elements. Observed values are invariably higher unless precautions are taken to use surfaces of rock that have not been exposed to the atmosphere for more than a few months. The observed excess of ionization is ascribed to active contamination resulting from nuclear explosions. A comparison is made between β- and γ-ray ionization in which it is shown that, unless mixing in the atomsphere is almost zero, the effect of γ rays greatly outweighs that of β rays. (auth)

3154 RME-2012

Division of Raw Materials, AEC

PRELIMINARY REPORT ON THE URANIUM OCCURRENCE OF THE SILVER LADY CLAIM, JAW BONE MINING DISTRICT, CROSS MOUNTAIN QUADRANGLE, KERN COUNTY, CALIFORNIA. Harry E. Nelson and Robert L. Hillier. June 1954. 19p.

An area of high anomalous radioactivity and visible uranium minerals in the Silver Lady Claims is associated with a nearly vertical north 70° west trending shear zone. The shear zone is 50 ft wide and over 2,000 ft long, cutting Jurassic (?) granite and Pliocene (?) volcanics. Fragments of metatorbernite covered granite are associated with molybdenite, molybdite, pyrite, quartz, sericite, and manganese oxide. The area is highly altered with a colorful oxidized zone of various shades of red and brown. (auth)

3155 AEC-tr-2099

EXTRACTION OF URANIUM FROM ORE CONCENTRATE. H. Chr. Neeb and K. Stockland. Translated from Forsvarets Forskningsinstitutt Arbok III, 3-16 (1950-51). 19p. Available from Henry Brutcher (Trans. No. 3474), Altadena, Calif.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 6-217.

3156

ACID PRESSURE LEACHING OF URANIUM ORES. F. A. Forward and J. Halpern (Univ. of British Columbia, Vancouver, Canada). J. Metals 7, 463-6(1955) Mar.

A new process is described for extracting uranium from ores containing sulphidic minerals, which comprises treating an aqueous pulp of the ore with air or oxygen at elevated temperatures and pressures. The acid required to dissolve the uranium is generated during the leach through oxidation of the sulphides. The chemistry of the process is discussed and laboratory results are presented to illustrate the operation of the method and the variables which control it. With most ores, leaching at a temperature of 130°C and an oxygen partial pressure of 10 psi provides uranium extractions of 90 to 95% in 4 to 6 hr. The acidity and level of dissolved impurities in the leach liquor can be kept fairly low. The method is characterized by a number of advantageous features including low reagent cost, short retention times, and high recoveries. (auth)

3157

PEGMATITES OF THE CRYSTAL MOUNTAIN DISTRICT, LARIMER COUNTY, COLORADO. William R. Thurston. U. S. Geol. Survey Bull. 1011, 1955. 18p.

More than 1,300 pegmatites in the Hyatt area north of the Big Thompson River are mapped and individually described. There are 27 pegmatites in the area that are made up of a wall zone and a core, and one, the pegmatite as the Hyatt mine, is composed of five zones. The largest pegmatites in the area are discordant in schist and occupy zones that are interpreted to be tear faults and tension fractures produced by the successive intrusion of granite that formed multiple sills. The majority of pegmatites in the large multiple sills were emplaced along the foliation and fractures. The pegmatites were intruded over a period of time and probably were derived from a granitic magma at different stages during differentiation. Ninety-six percent of the pegmatites are granitic, 3.5 percent are quartz-rich pegmatites, and a few are tourmaline-rich. Solutions escaping from many of the pegmatites tourmalinized and silicified the wall rocks for a few inches to 2 feet, but chemical and spectrographic analyses fail to show the transport of any other constituents. Perthite, plagioclase, and quartz are the essential minerals of the pegmatites, and muscovite is a minor but widespread constituent. Tourmaline, garnet, beryl, and apatite are common accessory minerals; and lithiophilite-triphylite, bismuthinite, uraninite, columbite-tantalite, and chrysoberyl are rare constituents. Beryl is found in 350 pegmatites, or 27 percent of the total, and makes up 0.01 percent or more of 77 pegmatite bodies. The beryl-bearing pegmatites are richest in two of the three large granite masses, and are somewhat less rich at a distance of more than a thousand feet from the margins of the intrusives, but contain the least beryl in the thousand-foot belt immediately surrounding the intrusives. The Hyatt pegmatite is by far the richest deposit of beryl in the area mapped. Most of the pegmatites mapped are "unzoned" or homogeneous pegmatites of uniform texture and mineral distribution. All gradations are visible between homogeneous pegmatites and zoned pegmatites. The interpretation is made that, for most pegmatites, the initial composition determines whether or not zones will form. Pegmatites containing many zones can form from a magma composed of the elements in perthite, plagioclase, quartz, and muscovite, depending on the proportions of the components crystallizing at any given time. The complexly zoned deposits depend for their formation on the presence of several of the rarer elements, principally lithium. Replacement textures in zones result from the interaction of the rest-liquid with the earlier-formed solid crystals. No mappable pegmatite in the Crystal Mountain district formed from the replacement of preexisting pegmatite by solutions escaping from the rest-liquid, or by solutions originating outside the pegmatite. Three beryl-bearing zoned pegmatites, the Hyatt, Big Boulder, and Buckhorn Mica deposits, were explored by core drilling. Each deposit is mapped and described in detail, and the mineral reserves are evaluated. The exploration indicates a total of 2,000 tons of beryl, of which 480 tons is estimated to be recoverable by hand sorting. The mapping of the 3¾ square miles in the Hyatt area indicates beryl in substantial additional resources. Small tonnages of scrap mica and perthite may be obtained from the Hyatt and Big Boulder prospects, and columbite-tantalite may occur in sufficient amounts at the Buckhorn Mica mine and Tantalum claim to produce several hundred pounds as a byproduct of beryl mining. Dumps at the various deposits contain 25 to 50 tons of beryl. (auth)

3158

URANIUM-BEARING SANDSTONE IN THE WHITE RIVER BADLANDS, PENNINGTON COUNTY, SOUTH DAKOTA. George W. Moore and Murray Levish. U. S. Geol. Survey Circ. 359, 1955. 7p.

The uranium mineral uranocircite, a barium uranyl phosphate, occurs in a channel sandstone in the Chadron formation of Oligocene age in the White River badlands, Pennington County, S. Dak. A vertical section of the basal 1-foot of the channel contains 0.25 percent uranium. Small amounts of metatyuyamunite (?) occur in the upper part of a freshwater limestone bed in the Chadron formation, and carnotite occurs in chalcedony veins in the overlying Brule formation, also of Oligocene age. The source of the uranium is thought to have been volcanic ash in the Brule formation and the overlying rocks of Miocene age. Downward moving ground water may have leached this uranium and deposited it in the rocks below. (auth)

3159

PHOTOGEOLOGIC MAP OF THE TIDWELL-12 QUADRANGLE, EMERY COUNTY, UTAH. MISCELLANEOUS GEOLOGIC INVESTIGATIONS MAP I-3. C. F. Miller. Washington, U. S. Geological Survey, 1954. $0.50

3160

PRESENCE OF PITCHBLENDE IN THE METAMORPHIC PERMO-TRIAS OF THE FRENCH ALPS. Charles Bizard. Compt. rend. 240, 791-3(1955) Feb. 14. (In French)

The presence of pitchblende deposits is detected in quartzite and schist formations near Champagny, Haute-Savaie, France. (K.S.)

3161

FLOTATION. Robert B. Booth (American Cyanamid Co., Stamford, Conn.). Ind. Eng. Chem. 47, 551-8(1955) Mar.

This review includes references on fundamental studies, flotation chemicals, rare and precious metal ores, sulfide ores, oxidized ores, metallic oxide ores, nonmetallic ores, coal, industrial applications, and control and instrumentation. 97 references. (L.T.W.)

3162

LEACHING. Robert A. Ebel (Carbide and Carbon Chemicals Co., Oak Ridge, Tenn.). Ind. Eng. Chem. 47, 576-8(1955) Mar.

This review includes references on general design data, oil extraction processes, organic processes, and metallurgical recoveries. 52 references. (L.T.W.)

METALS AND METALLURGY

3163 AD-10278
Massachusetts Inst. of Tech.
KINK BAND FORMATION IN HIGH-PURITY ALUMINUM DURING CREEP AT HIGH TEMPERATURES. Andre M. Gervais, John T. Norton, and Nicholas J. Grant. [Feb. 1953]. 34p. Contract AF33(038)-23281.

Kink bands were observed to form during tensile-creep testing (800 to 1150°F) of high-purity (99.995%) aluminum specimens having large grain sizes. The tests were made with grains which occupied the whole cross section of the specimen. The specimens which were originally round (diameter of 0.187 in., gage length of 1 in.), had parallel flats milled to simplify metallographic and x-ray observations. The final thickness was 0.120 in., and the final gage length was 0.85 in. The formation of the kink bands indicated the need for a bending moment during the deformation in tension of a specimen. The kinking plane (110) was perpendicular to the slip direction [110] outside the kink band. The regions located between the slip bands within the kink band rotated progressively about axes defined by the intersection of the kinking plane with the slip planes. Two different slip systems, (111) and (100), were observed. In contrast to the usual case, the kink bands formed in regions which were not previously crossed by a slip system. The bands occurred under the influence of bending moments only; slip, which took place simultaneously inside the bands, was a consequence of kinking. The kink bands kept the same width during the deformation process. (ASTIA abst.)

3164 AD-26783
Battelle Memorial Inst.
EFFECT OF ELEVATED TEMPERATURE ON THE FATIGUE STRENGTH OF SINTERED ALUMINUM POWDER. ANNUAL SUMMARY REPORT [FOR JANUARY 15, 1953—JANUARY 15, 1954]. W. S. Hyler and H. J. Grover. Jan. 15, 1954. 16p. Contract AF33(616)-434.

Studies were made of the elevated temperature fatigue behavior of sintered Al alloys. The alloys were tested as notched and unnotched specimens in order to estimate their notch sensitivity from 800 to 1000°F. (J.E.D.)

3165 AD-28877
American Electro Metal Corp.
INVESTIGATION OF THE INTERMETALLIC COMPOUNDS OF ALUMINUM. PROGRESS REPORT NO. 3 [COVERING THE PERIOD DECEMBER 15, 1953 TO FEBRUARY 15, 1954]. William H. Herz. Feb. 15, 1954. 13p. Contract AF 33(038)-10716.

The preparation, sintering, chemical analysis of powder and hot-pressed and crushed pieces, resistivity, density, percent O_2, stress-rupture, transverse rupture strength, and impact strength of hot-pressed NiAl—Ti alloy compositions are presented. In addition, the preparation of the NiAl—Zr alloy is briefly discussed. The density, resistivity, stress-rupture, and transverse rupture strength of hot-pressed NiAl—4% Zr are given. (J.A.G.)

3166 AD-44256
Armour Research Foundation
PHASE RELATIONSHIPS IN MAGNESIUM—LITHIUM—ALUMINUM AND MAGNESIUM—LITHIUM—ZINC ALLOYS. FINAL REPORT [FOR] APRIL 30, 1953—JULY 1, 1954. Sept. 15, 1954. A. F. Weinberg, D. W. Levinson, and W. Rostoker. Sept. 15, 1954. 103p. Contract DA-11-022-ORD-906.

A study was made of equilibrium phase relationships in the systems Mg—Li—Al and Mg—Li—Zn using the methods of metallographic analysis, x-ray diffraction, and thermal analysis. Four partial isotherms are presented for each system for 400, 300, 200, and 100°C. In addition several appropriate vertical sections are constructed for each system. The structure of the ternary $MgLiAl_2$ phase was determined, as was the compositional range of esistence of the ternary θ (MgLiZn) phase. The four-phase peritectic type reaction Liq + θ + β + δ (LiZn) was found in the Mg—Li—Zn system at a temperature of 317 ± 2°C. Neither the $MgLi_2Al$ nor the $MgLi_2Zn$ phases previously reported to exist in these systems are equilibrium phases. There is evidence that they may exist as transition phases. (auth)

3167 CAL-455-M-6
Cornell Aeronautical Lab.
MULTI-ARC WELDING INVESTIGATION OF METHOD FOR WELDING ALUMINUM IN NAVAL CONSTRUCTION. FINAL REPORT. C. W. Steward. July 1, 1947. 15p. Contract NObs-45099. (ATI-154254)

The broader electrical aspects of the multi-arc system are discussed, and oscillograph records are presented with accompanying analysis for welding under different work conditions. Flux entrapment can be avoided in lap and fillet welds by providing a good fit-up prior to welding. The most satisfactory method for eliminating cracking during welding of 75S alloy is to change rods and "pick up" the weld with as little delay as possible. (L.M.T.)

3168 EES-040038F(6)
Naval Engineering Experiment Station, Annapolis
INVESTIGATION OF CRACKING IN STAINLESS STEEL AUXILIARY BOILERS FOR AM 421 CLASS MINE SWEEPERS. W. Lee Williams. Aug. 6, 1954. 32p.

This is the second report in a series dealing with the problem of cracking in stainless steel auxiliary boilers for nonmagnetic mine sweepers. Inspections of several boilers and of laboratory corrosion specimens tested in high temperature water are discussed. The work confirms previous observations regarding the susceptibility of stainless steel to stress-corrosion cracking in boiler water environments of practical interest. The most critical zones are those in which waterside crevices exist near welded joints. The problem has not yet been solved, but steps are being taken along three lines: redesign of joints to elminate crevices; development of special boiler water treatments; and, the use of nonmagnetic constructional materials other than stainless steel. (auth)

3169 EES-040038F(8)
Naval Engineering Experiment Station, Annapolis
INVESTIGATION OF CRACKING IN A SILICON BRONZE AUXILIARY BOILER FOR AM 421 CLASS MINE SWEEPERS. W. Lee Williams. Oct. 15, 1954. 24p.

This report is the fourth in a series dealing with the problem of cracking in auxiliary boilers for nonmagnetic mine sweepers. It covers a destructive examination of a Cyclotherm type boiler, made of silicon bronze except for copper tubes. This boiler had leaked after 2,042 hours of operation. The rolled tube joints were in good condition, and the few joint leaks were attributed to relaxation of the copper tubes. The leaks at the fire tube-header welds were caused by weld cracking from the fireside, and progression of the cracks from thermal stresses during operation. The shell leaks were caused by waterside stress-corrosion near welds. The boiler had not been stress relieved after fabrication. (auth)

3170 ISC-572
Ames Lab.
THE RACHINGER CONVERSION RULE. B. A. Rogers, Louis Ried, Jr., and Paul E. Palmer. Feb. 8, 1955. 7p. Contract W-7405-eng-82.

The theory, design, and performance of a Rachinger conversion slide rule for the conversion of atomic to weight percentages for binary alloys and compounds is presented. (J.A.G.)

3171 NACA-TN-3380
Carnegie Inst. of Tech.
STUDY OF EFFECTS OF MICROSTRUCTURE AND ANISOTROPY ON FATIGUE OF 24S-T4 ALUMINUM ALLOY. H. A. Lipsitt, G. E. Dieter, G. T. Horne, and R. F. Mehl. [Sept. 30, 1953]. 42p.

The results of an investigation of the statistics of the effects of variation in microstructure (extruded and extruded plus recrystallized) on the fatigue properties of 24S-T4 aluminum alloy notched specimens tested in both the longitudinal and transverse directions are discussed. (auth)

3172 NP-5549
Minerals Research Lab., Inst. of Engineering Research, Univ. of Calif., Berkeley
FRACTURE OF MAGNESIUM ALLOYS AT LOW TEMPERATURE. TECHNICAL REPORT NO. 3 [FOR] SEPTEMBER 1, 1954 TO FEBRUARY 1, 1955. F. E. Hauser, P. R. Landon, and J. E. Dorn. Feb. 15, 1955. 40p. Contract DA-04-200-ORD-171.

The flow and fracture strengths of polycrystalline aggregates of high-purity magnesium and an alpha solid solution of Al in Mg were determined as functions of temperature and grain size. Over the high temperature range the fracture stress decreased with increasing test temperatures in a manner that closely paralleled the flow stress-temperature relationship. But over the low temperature range, the fracture stress was almost constant, independent of the test temperature, following the trend that is typical for the low temperature brittle fracturing of polycrystalline aggregates of body-centered cubic and close-packed hexagonal metals. Even at 78°K, however, plastic strains of one to 7% were obtained preceding onset of "brittle" fracturing. The plastic strains that were obtained in the brittle fracture range increased temperature and decreasing grain size. Over the entire range of temperatures that was investigated, the flow strength was observed to increase linearly with the reciprocal of the square root of the mean grain diameter. This observation was rationalized in terms of slip induced by shear stresses arising from a series of dislocations piled up at an opaque grain boundary. Over the brittle-fracture range of temperatures, the fracture stress also increased linearly with the reciprocal of the square root of the mean grain diameter. This observation was rationalized in terms of cohesive fracturing induced by tensile stresses arising from a series of edge dislocations piled up at an opaque grain boundary. On the basis of these analyses the brittle fracturing of Mg was correlated with the brittle fracturing of Zn, W, Mo, and Fe. Several suggestions were made for increasing the brittle-fracture strength and decreasing the sharp transition temperature for ductile to brittle fracturing of Mg alloys. (auth)

3173 NP-5552
Powder Metallurgy Lab., Stevens Inst. of Tech.
NAVY PROJECT FOR INVESTIGATION OF HEAT RESISTANT ALLOYS OF METAL POWDERS. FINAL REPORT [FOR APRIL 1, 1949 TO DECEMBER 31, 1952]. Donald P. Ferriss, Lambert H. Mott, and Gregory J. Comstock. Dec. 31, 1952. 60p. Contract NObs-46508.

A final summary of the investigation of heat-resistant alloys of metal powders with emphasis on alloy X-4 is presented. After investigating the cold-press and hot-press methods of fabricating B_2 turbosupercharger buckets and specimens for mechanical testing at room and high temperatures, attention was turned to a thorough study of the hot coining process, which involves forging the pressed and sintered compact in shaped dies to 100% relative density. Fabrication procedure and preform design for the B_2 turbosupercharger bucket are presented along with a detailed study of the microstructure. The physical properties of the hot-coined material for various heat treatments are given, including room and elevated temperature tensile strengths, hardness, and stress-rupture data. The results of these tests indicate that 100% dense, heat-treatable parts can be made from prealloyed X-40 powder by the hot-coining process. In hot coining the bucket preforms, as fabricated by powder metallurgical methods, the die dimensions were duplicated within .004 in. Published data on room temperature tensile strengths and ductility of cast X-40 were exceeded by up to 50% by the hot-coined material. Even more significant was the fact that stress-rupture properties of the cast material were also exceeded by several heat treatments applied to the hot-coined X-40. In accomplishing these very favorable mechanical properties, one feature of heat treatment peculiar to powder metallurgy played an important part. That is, the coarse grain boundary carbide network, which is characteristic of the cast material, may be readily avoided in a hot-coined specimen merely by fabricating specimens or parts below the temperature of formation of this carbide. However, the cast structure containing the carbide network may be duplicated, if desired, by heat treating the hot-coined specimen. It was found impossible to put the carbides back into solution after they had precipitated at the grain boundaries. Stress-rupture data were obtained on specimens having a cast microstructure and were found to equal or exceed the properties of the cast material made by conventional methods as published in the literature. (auth)

3174 NP-5554
Laboratories for Research and Development, Franklin Inst.
THE COPPER—PALLADIUM SYSTEM IN THE COMPOSITION RANGE FROM 0 TO 30 ATOMIC PERCENT PALLADIUM. FINAL REPORT [FOR] DECEMBER 22, 1952 TO NOVEMBER 30, 1954. Frank E. Jaumot, Jr. and Anton Sawatzky. 105p. Contract DA-36-034-ORD-1169. (F-2350)

The copper-palladium system in the composition range from 6 to 30 at.% palladium has been studied from the standpoint of order-disorder phenomena, the effects of cold-work distortion, and the anneal properties of the alloys. These phenomena have been investigated by means of x-ray diffraction, electrical resistivity, magnetic susceptibility, thermoelectric power, thermal coefficient of resistivity, and isothermal anneal studies. A survey of the order-disorder phenomena suggests that the presently accepted phase diagram is in need of serious revision. The ordering most probably takes place by a nucleation and growth process. The activation energy for growth or ordered domains is approximately 42 kcal/mol for samples quenched from 800°C. The nucleation process is probably not a singly activated process but the average activation energy in the temperature range considered is of the order of 20 kcl/mol. Samples preciously cold-worked appear to have a slightly lower activation energy for growth of the ordered domains. When quenched Cu—Pd alloys are cold worked at room temperature, the electrical resistivity decreases; the magnetic susceptibility increases; the temperature coefficient of resistivity decreases; and the thermoelectric power becomes increasingly negative. Attempt is made to explain these phenomena in terms of a shift in the relative centers of gravity of the s-p and d bands. (auth)

3175 NP-5560

Electrical Engineering Research Lab., Engineering Experiment Station, Univ. of Ill.

CONDUCTING THIN FILMS. QUARTERLY TECHNICAL PROGRESS REPORT [FOR] OCTOBER 1, 1954 TO DECEMBER 31, 1954. C. E. Drumheller, R. C. Eggleton, and L. L. Howard. Jan. 15, 1955- 32p. Contract AF33 (038)-21255, Report No. 15.

Data are presented from a study of the crystallite transition caused by exposure of evaporated Bi films to an electron beam. Instrumentation and techniques used in obtaining motion pictures of Bi film crystallite activity as observed under the electron microscope are described in detail. Data are included from temperature-resistance and long-term resistance studies of evaporated Bi films. (C.H.)

3176 NP-5572

Crane Co.

RELAXATION BEHAVIOR OF TITANIUM ALLOYS. QUARTERLY PROGRESS REPORT NO. 3. E. A. Sticha. Jan. 15, 1955. 13p. Contract AF33(616)-2400.

Data are tabulated on the tensile properties and relaxation behavior of samples of Ti alloys. Load-deformation curves for the various materials under study are included. (For preceding period see NP-5496.) (C.H.)

3177 NYO-7006

Massachusetts Inst. of Tech.

THERMODYNAMICS OF METAL SOLUTIONS. TECHNICAL PROGRESS REPORT. M[ichael] B. Bever, P. Greenfield, G[eorge] Scatchard, and C[arl] Wagner. Mar. 1, 1955. 4p. Contract [AT(30-1)-1002]. Scope I.

The energy stored by drilling, filing, torsion, wire-drawing, and rolling a 75% Au—25% Ag alloy at room temperature and at 78°K are briefly discussed and results given. The values of the total energy of deformation are also given. Measurement of the vapor pressures over the solid α Cd—Ag alloy is discussed. A hollow cathode discharge tube proved to be a suitable source of the Cd resonance line. The electromotive force of galvanic cells involving pellets of a solid solution of CaO in ZrO_2 as electrolyte was measured between about 800 and 1100°C. (J.A.G.)

3178 PA-TR-2061

Samuel Feltman Ammunition Labs., Picatinny Arsenal

A SURVEY OF AVAILABLE LITERATURE ON THE RAPID COMBUSTION OF METALS IN AIR. Saul Haffner. Sept. 1954. 20p. (AD-44543)

A literature search was made of the available literature covering experimental techniques, theories, and information concerning the rapid combustion of metals in air. The object of the search was to determine what metals or combinations of metals would be the most suitable constituents for photoflash bombs, based upon their light emission characteristics on rapid combustion as reported in the literature. A chronological, annotated bibliography covering the major portion of the research, tables listing the experimental results of several investigations, and tables listing various combinations of metals, which upon combustion provide a great deal of light per unit weight are included. 25 references. (C.H.)

3179 SO-2518

General Electric Research Lab.

TENSILE PROPERTIES OF ZIRCONIUM—CHROMIUM ALLOYS—PARTICLE-STRENGTHENING EFFECTS. J. H. Keeler. Mar. 1955. 32p. Contract W-31-109-Eng-52. (RL-1251)

The tensile properties of zirconium—chromium binary alloys containing up to 18 at. % Cr are reported for the temperature range —195 to 500°C. The highest yield strength obtained at 500°C was about 26,000 psi (for the 18 at. % Cr alloy). No significant solid-solution hardening in alpha zirconium was observed. A linear relation between the flow stress and volume fraction of the compound was observed. The particle-hardening effect increased with strain in the range of true strain 0.002 to 0.05, and made a greater total strengthening contribution at lower temperatures. The normalized (per cent) increase in strength was essentially independent of testing temperature except at the highest temperature where the alloys showed signs of instability. (auth)

3180 SO-2519

General Electric Research Lab.

DEVELOPMENT OF ZIRCONIUM-BASE ALLOYS. TWENTY-FIRST QUARTERLY REPORT. (PROGRESS REPORT NO. 22). J. H. Keeler. Jan. 5, 1955. 10p. Contract W-31-109-Eng-52. (RL-1261)

The preferred orientation in cold-reduced and in annealed sheets of a Zr—3 at. % Cr alloy was found qualitatively similar to unalloyed zirconium. A plot of d ln L/d ln ϵ versus ϵ for early-maximum-load type tensile curves showed deviation from a straight line and the beginning of localized necking at strains considerably beyond the strain for maximum load. The conclusions from a forthcoming Occasional Report on zirconium—chromium alloys are presented. The short-time tensile characteristics of zirconium—molybdenum binary alloys are given. The presence of unstable, untransformed body-centered-cubic phase in these alloys is thought to account for their tensile behavior. (For preceding period see SO-2517.) (auth)

3181 WADC-TR-52-51[Pt.1]

Bjorksten Research Labs., Inc.

FOAMED METAL LOW DENSITY CORE MATERIAL FOR SANDWICH CONSTRUCTION. J[ohan] Bjorksten, J[ohn] C. Elliott, and R[obert] J. Roth. June 1952. 20p. Contract AF33(038)-21838. (ATI-150135)

Metallic low density foams were produced from magnesium—aluminum alloys using either titanium or zirconium hydride as the foaming agent. The most effective procedure consisted of the prior preparation of a mixture of the hydride and the magnesium—aluminum eutectic alloy as the foaming agent. Incorporation of the melted foaming agent into the molten alloy to be foamed at a temperature slightly above its melting point produces a mixture, which on solidification is a satisfactory metallic foam. By this procedure, a foam with a density of 15 lb/ft^3 was obtained from the 95% Al–5% Mg alloy. This foam had a nominal cell size of about $^1/_{16}$ inch. The cell size was quite uniform. More than 80% of the cells were $^1/_{16}$ in. or less. 2% zirconium hydride was used to produce this foam. (auth)

3182 WADC-TR-52-51(Pt.2)
Bjorksten Research Labs., Inc.
FOAMED METAL LOW DENSITY CORE MATERIAL FOR SANDWICH CONSTRUCTION. Johan Bjorksten, John C. Elliott, and Robert J. Roth. Sept. 1953. 24p. Contract AF33(038)-21838. (AD-15741)

Progress on the development of an extrusion process for the preparation of metallic low-density foams from Mg–Al alloys is described. Preparation of eutectic-hydride foaming agent and a foamed metal and design of equipment, including mold, crucible, and extruder are discussed. (J.A.G.)

3183 WADC-TR-54-616(Pt.1)
Materials Lab., Wright Air Development Center
HYDROGEN CONTAMINATION IN TITANIUM AND TITANIUM ALLOYS. PART 1. HYDROGEN EMBRITTLEMENT IN ALPHA-BETA TITANIUM ALLOYS. (REPORT OF WADC TECHNICAL MEETING OCTOBER 29, 1954). Ralph J. Kotfila and Harris N. Burte, eds. Jan. 1955. 183p.

Hydrogen contamination in α-β titanium alloys can cause low ductility in slow strain rate, room temperature tensile tests, and premature brittle fracture in room temperature rupture tests. The combination of stress concentrations and hydrogen contamination can lead to a drastic decrease in the load carrying capactiy of these alloys. Another result of hydrogen contamination is increased susceptibility to embrittlement as a result of exposure to stress and elevated temperature. A maximum hydrogen content of 125 ppm is suggested as a tolerance for aircraft quality α-β titanium forging alloys. Data are presented which show that in the future it will be possible to produce alloys which have much higher tolerances for hydrogen. (auth)

3184 AEC-tr-2089
ON THE ALLOYS OF GERMANIUM WITH BISMUTH, ANTIMONY, IRON, AND NICKEL. (Über Die Legierungen Des Germaniums Mit Wismut, Antimon, Eisen, Und Nickel). Kurt Ruttewitt and Georg Masing. Translated from Z. Metallkunde 32, 52-61(1940). 38p. (AEC-tr-2089)

Phase studies were made on Bi–Ge, Sb–Ge, Fe–Ge, and Ni–Ge alloys and the Ni–Si system and results are given. State diagrams and microstructures for each are presented. (J.A.G.)

3185
METALLIC TERNARY PHASES IN THE Mn–Ta–O SYSTEM. Nils Schönberg (Univ. of Uppsala, Sweden). Acta Met. 3, 14-16(1955) Jan.

Mn–Ta–O samples have been prepared in different ways and have been examined by x-ray methods. Two ternary phases have been found to exist, i.e., the metallic Mn_2Ta_2O phase of the η-carbide structure and the Mn_2TaO_3 phase of a structure closely related to that of CoSn (B35 type). The abnormally great interatomic metal-metal and metal-oxygen distances indicate weak metallic as well as nonmetallic (ionic) properties for the latter phase. The configurations of the ternary phases in the Mn–Ta–X systems, where X is any of the nonmetals C, N, and O, have been discussed. (auth)

3186
THE SEGREGATION OF IMPURITIES TO GRAIN BOUNDARIES. W. R. Thomas (Univ. of Toronto, Canada) and B. Chalmers (Harvard Univ., Cambridge, Mass.). Acta Met. 3, 17-21(1955) Jan.

It has been experimentally shown that polonium segregates to grain boundaries in an alloy of lead and 5 per cent bismuth in which the polonium was present to the extent of one part in 10^{10}. The results show that the amount of polonium contained in the boundary is a function of orientation of the crystals adjacent to the boundary and of the temperature at which equilibrium is attained. The boundaries were produced by symmetrical rotations of seed crystals about the [001] direction so that the boundaries consisted mainly of edge type dislocations. The number of polonium atoms is calculated for boundaries with θ up to 15 degrees to be one atom of polonium in every 2×10^3 dislocation sites; a dislocation site is the intersection of a dislocation and an atomic plane. The number increases to about four times this value for boundaries with an orientation difference of 25 degrees. The concentration of polonium in the boundaries decreased rapidly with annealing temperature; only the high-angle boundary segregate persists at the higher annealing temperatures. (auth)

3187
THE YIELD PHENOMENA, KINK BANDS AND GEOMETRIC SOFTENING IN TITANIUM CRYSTALS. A. T. Churchman (Associated Electrical Industries, Ltd., Aldermaston, Berks, England). Acta Met. 3, 22-9(1955) Jan.

Single crystals of titanium grown by a modification of the strain anneal technique show discontinuities in the stress strain relationship when containing 0.1 wt. % oxygen and nitrogen. The discontinuities are explained as a manifestation of the yield phenomenon modified by geometric softening taking place during the formation of kink bands. An explanation of fragmentation is suggested for materials which form kink bands. (auth)

3188
LATTICE AND GRAIN BOUNDARY SELF-DIFFUSION IN CADMIUM. E. S. Wajda, G. A. Shirn, and H. B. Huntington (Rensselaer Polytechnic Inst., Troy, N. Y.). Acta Met. 3, 39-42(1955) Jan.

The bulk and grain-boundary diffusion in cadmium of 99.5 per cent purity have been measured as a function of temperature. The bulk diffusion constants as measured in single crystals are given by $D_{v||} = 0.05$ cm^2/sec exp(−18,200 cal/mol-RT) and $D_{v\perp} = 0.10$ cm^2/sec exp(−19,100 cal/mol-RT, where $D_{v||}$ and $D_{v\perp}$ refer respectively to diffusion parallel and perpendicular to the hexagonal axis. The grain boundary diffusion gave $D_b = 1.0$ cm^2/sec exp(−13,000 cal/mol-RT). These results are compared with analogous values obtained for zinc. The implication for the determination of mechanism is in this case less clear cut. (auth)

3189
NUCLEAR ELECTRIC QUADRUPOLE INTERACTIONS IN ALUMINUM. T. J. Rowland (Harvard Univ., Cambridge, Mass.). Acta Met. 3, 74-8(1955) Jan.

An experimental study of the nuclear magnetic resonance absorption of aluminum in solid solutions containing zinc or magnesium as solute is presented. The magnitude of the electric gradients caused at the Al lattice sites by the solute atoms is estimated and compared with the relative sizes of various solute atoms in a common solvent. Effects of precipitation and annealing have also been detected, and some possible applications are discussed. (auth)

3190

SUB-GRAIN FORMATION IN ALUMINUM DEFORMED AT −183°C. A. Kelly and W. T. Roberts (Cavendish Lab., Cambridge, England). Acta Met. 3, 96-7(1955) Jan.

Fine-grained specimens of pure Al (99.99%), deformed at −183°C, were examined by x-ray microbeam methods at the low temperature and at room temperature immediately after deformation. X-ray microbeam back-reflection photographs are shown, and conclusions are drawn. (L.T.W.)

3191

THE DIFFUSION OF HYDROGEN IN IRON AND FERRITIC STEELS. E. W. Johnson and M. L. Hill (Westinghouse Research Labs., East Pittsburgh, Penna.). Acta Met. 3, 99-101(1955) Jan.

3192

INTERNAL FRICTION IN TITANIUM AND TITANIUM OXYGEN ALLOYS. H. H. Bleakney (Department of Mines, Ottawa, Ontario, Canada). Acta Met. 3, 103-4(1955) Jan.

Pratt, Bratina, and Chalmers in their paper entitled "Internal Friction in Titanium and Titanium—Oxygen Alloys" (Acta Met. 2, 203(1954)) implicitly, if not explicitly, accept the concept of stress relaxation across grain boundaries for which T. S. Kê (Phys Rev. 71, 533(1947)) first provided experimental evidence. In the present paper evidence is presented which conflicts with Kê's explanation for the sharp drop in the modulus of rigidity of Al at elevated temperatures and therefore conflicts with that explanation as applied to Ti. The evidence on Al may be used to prove that stress relaxation across grain boundaries cannot be the explanation for the rapid drop of the modulus of rigidity. (L.T.W.)

3193

THE CONTROL OF QUALITY IN HEAT-TREATMENT AND FINAL OPERATIONS IN THE PRODUCTION OF ROLLED, EXTRUDED, AND DRAWN ALUMINIUM AND ALUMINIUM ALLOYS. A. J. Field and J. Salter (British Aluminium Co., Ltd., London). J. Inst. Metals 83, 199-220(1955) Feb.

Aspects of heat treatment and final fabricating practice that should be controlled to ensure a satisfactory quality in the production of rolled, extruded, and drawn aluminium and aluminium alloys are discussed. The operations covered include sheet shearing from coil, flattening, finish shearing, slitting, blanking, straightening of sections, drawing and finishing of tubes, inspection and packing. Some practical aspects of heat treatment are also dealt with. (auth)

3194

THE HEAT-TREATMENT, INSPECTION, AND TESTING OF WROUGHT NICKEL AND NICKEL ALLOYS. W. Betteridge (Mond Nickel Co., Ltd, Birmingham, England) and T. E. Cound (Henry Wiggin and Co., Ltd., Birmingham, England). J. Inst. Metals 83, 262-70(1955) Feb.

The production of wrought nickel and nickel alloys is described, with particular reference to the heat treatment, inspection, and testing procedures applied after all hot- or cold-working operations are completed; brief descriptions of the various working methods are also included. The materials dealt with are notable for their wide variety of special properties, and the testing and inspection methods adopted are necessarily referred to only in outline. (auth)

3195

THE CHOICE AND CONSTRUCTION OF MONOLITHIC LININGS FOR TWIN-BATH INDUCTION FURNACES FOR MELTING ALUMINUM ALLOYS. E. J. Thackwell (Northern Aluminium Co., Ltd., Rogerstone, Monmouthshire, England). J. Inst. Metals 83, 283-94(1955) Feb.

Considerable difficulties have been met in establishing a satisfactory practice for the formation of a lining possessing the necessary metallurgical, mechanical, and thermal properties to withstand the severe service conditions sometimes encountered in a large, twin-bath low-frequency induction furnace employed for melting aluminium alloys. Several techniques and various types of lining, the possibilities of which have been explored, are briefly described, and reasons are set out for the final choice of a densely rammed fully monolithic lining, formed and fired in situ. Sections are also included on the design of steel liming formers, extraction tools, and other accessories; preparation of the refractory mix; ramming procedure; the firing of the lining; and the ultimate commissioning of the furnace. (auth)

3196

UNUSUAL FABRICATING TECHNIQUES OVERCOME SHRINK FITTING PROBLEMS. R. G. Townsend (Knolls Atomic Power Lab., Schenectady, N. Y.). Iron Age 175, No. 10, 104-5(1955) Mar. 10.

Inserting a 1¼ in. diam. high-speed steel pin into a 6 in. diam. Type 410 stainless steel ring presented a difficult shrink fitting problem at Knolls Atomic Laboratory. Accurately located at the center of the ring was a Type 347 stainless part with a 1-in. long hole having an interference fit of 0.002 in. The shrink fit operation was complicated by the need for careful positioning of the entire assembly. The method used permitted shrink fitting with consistent results to 0.002 in. per inch on a Type 347 stainless assembly. (auth)

3197

WELDING TITANIUM WITHOUT FILLER ROD IMPROVES JOINT EFFICIENCY. A. V. Levy and Robert Wickham (Marquardt Aircraft Co., Van Nuys, Calif.). Iron Age 175, No. 11, 99-102(1955) Mar. 17.

The welding of commercially pure annealed and pickled Ti without filler rod to reduce weld grinding is discussed. Bend and tensile properties, hardness, and microstructure of the weld are discussed. Without the filler rod, the A blanket remained unbroken and symmetrical, affording better weld protection against dropping, undercutting, and contamination. The use of a low-conductivity mild steel backup bar retarded chilling permitting a reduction in welding current and air contamination. The heat-transfer characteristics of the backup bar were also changed by varying the size and shape of the groove. Contamination reduction by hydrofluoric acid—nitric acid pickling, stainless steel wire brushing, and A flow-rate adjustments, and weld ductility indication by color changes due to oxide layer growth are discussed. (J.A.G.)

3198

HOW TITANIUM ALLOYS BEHAVE AT HIGH TEMPERATURES. D. R. Luster and B. L. Shakely (Rem-Cru Titanium, Inc., Midland, Penna.). Iron Age 175, No. 12, 96-9(1955) Mar. 24.

The effects of elevated temperatures on the tensile properties of annealed sheet and bar Rem-Cru alloys C-110M C-130AM, and A-110AT are presented. Results show that stability and uniformity of properties are generally good. Useful strengths are available to 1200°F, and in long-term application to 1000°F. Results are summarized in graphs including tensile properties, modulus of elasticity, stress vs. cycles to failure and stress-rupture. (J.A.G.)

3199

TITANIUM REFERENCE SHEET. PART 1. G. E. Hutchinson (Rem-Cru, Inc., Midland, Penna.). Chem. Eng. Progr. 51, 34(1955) Mar.

The composition, availability, mill forms, alloy grades, forming, welding, and mechanical, physical, and chemical properties of Ti are briefly reviewed. (J.A.G.)

3200

TITANIUM FILLS NEED FOR SUPER MATERIAL IN AIRCRAFT OF THE FUTURE. N. E. Promisel (U. S. Navy Bureau of Aeronautics, Washington, D. C.). J. Metals 7, 443-8(1955) Mar.

Titanium is found useful for minimizing aircraft weight and size as airplane speeds increase into the supersonic range and operating temperatures and times increase. The most general structural advantage of Ti shows up above about 300°F. (J.E.D.)

3201

THE EXTRACTIVE METALLURGY OF ZIRCONIUM BY THE ELECTROLYSIS OF FUSED SALTS. III. EXPANDED SCALE PROCESS DEVELOPMENT OF THE ELECTROLYTIC PRODUCTION OF ZIRCONIUM FROM K_2ZrF_6. Bertram C. Raynes, Edward L. Thellmann, Morris A. Steinberg, and Eugene Wainer (Horizons Inc., Cleveland, Ohio). J. Electrochem. Soc. 102, 137-44(1955) Mar.

The electrolysis of K_2ZrF_6 in an electrolyte of NaCl to produce ductile zirconium metal has been expanded from the laboratory scale into a larger scale operation. An electrolytic cell capable of producing 3 or 4 lb of zirconium metal per run was designed and operated. Following successful operation of this unit, a cell capable of producing 30 to 40 lb of zirconium metal per run was used to evaluate the process on a scale 50 to 60 times the laboratory scale. Electrolytic zirconium powder of high purity has been reproducibly obtained in good yields and at commercially acceptable current efficiencies. Upon consolidation the metal shows fabricating properties comparable to those exhibited by Kroll sponge zirconium. The present larger electrolytic cell produces zirconium metal at a rate approaching that of the original commercial Kroll sponge producing reactors. Further expansion to larger scale operation should be entirely feasible. (auth)

3202

THERMAL CONDUCTIVITY OF INDIUM–THALLIUM ALLOYS AT LOW TEMPERATURES. Ronald J. Sladek (Univ. of Chicago). Phys. Rev. 97, 902-15(1955) Feb. 15.

The thermal conductivity of a series of homogeneous, solid solution indium–thallium alloys containing up to 50 atomic percent of thallium has been measured as a function of temperature at liquid helium temperatures and as a function of both longitudinal and transverse magnetic fields below T_c, the superconducting transition temperature in zero field. The normal-state results agree quite well with the quasi-free electron theory of metals. The superconducting-state results agree with the hypotheses that electrons in the "superconducting phase" neither transport heat nor scatter phonons. For pure indium, it was found that $K_{es}/K_{en} = 2t^2/(3 + t^4)$, where K_{es} and K_{en} are the electronic thermal conductivities at a given temperature when the specimen is superconducting and when it is nonsuperconducting, respectively, and $t = T/T_c$. For all the alloy specimens the ratio of the lattice thermal conductivities comprised a family of curves such that $t^{-3}<K_{gs}/K_{gn}<t^{-6}$. A thermal resistivity maximum was found to accompany the isothermal destruction of superconductivity by either a longitudinal or a transverse magnetic field in specimens containing 15 percent Tl or more. When the applied field was reduced to zero, the final thermal resistivity of most of these specimens was greater than would be expected for a simple mixture of superconducting and "frozen-in" normal regions, the concentration of the latter being estimated from magnetic induction measurements. Both this effect and the maxima themselves are thought to be manifestations of an increased lattice thermal resistivity due to alteration of the mean free path of phonons when they approach the boundary between a superconducting and a normal region. (auth)

3203

THE SALE OF URANIUM-CONTAMINATED SCRAP CARBON STEEL TO COMMERCIAL CHANNELS. H. J. McAlduff (U. S. Atomic Energy Comission, Oak Ridge, Tenn.). Am. Ind. Hyg. Assoc. Quart. 16, 73-5(1955) Mar.

Criteria for the sale and shipping of scrap carbon steel contaminated with U are summarized. (C.H.)

3204

STRUCTURE OF Hg–Mn SYSTEMS. F. Lihl. Monatsh. chem. 86, 186-90(1955) Feb. (In German)

Investigation of the structure of Hg–Mn alloys showed the existance of two phases of the composition Mn_2Hg_5 and MnHg. MnHg, which crystallizes in B2-type with lattice constant a = 3.308 kX · E, is stable up to 265°C, Mn_2Hg_5 in contrast, is stable only up to 75°C. The latter phase results through peritectic reaction of MnHg giving a saturated alloy. The investigation established the fundamental structure of the binary system Hg–Mn. (tr–auth)

3205

EFFECT OF LOW TEMPERATURES ON THE MECHANICAL PROPERTIES OF A COMMERCIALLY PURE TITANIUM. Glenn W. Geil and Nesbit L. Carwile. J. Research Natl. Bur. Standards 54, 91-101(1955) Feb.

Notched and unnotched tensile specimens of annealed commercially pure titanium were slowly strained to fracture in single-stage test at −196° to +100°C. Unnotched tensile specimens also were strained in two-stage tests (strained at one temperature until just after the maximum load was reached and then strained to fracture at a different temperature) to reveal the effect of prior-strain-temperature history on the tensile properties of the titanium. Impact tests were made on Charpy V-notch specimens at −196° to + 200°C for a determination of the impact notch-toughness of the metal. True-stress–true-strain relations were determined for the titanium in tension, and a study was made of the effects of test temperature and the stress distribution on the rates of work-hardening of the metal. (auth)

3206

DIFFUSION AND OXIDATION OF SOLID METALS. C. E. Birchenall (Princeton Univ., N. J.). Ind. Eng. Chem. 47, 604-13(1955) Mar.

This review includes references on diffusion (volume diffusion of substitutional alloys, Kirkendall effect, diffusion in interstitional alloys, grain-boundary and surface diffusion, diffusion in Ge and Si), and oxidation (reviews, properties of oxides and related crystals, oxidation of pure metals, oxidation of alloys). 135 references. (L.T.W.)

PHYSICS

3207 AD-15789
Servomechanisms Lab., Mass. Inst. of Tech.
BIBLIOGRAPHY ON DATA STORAGE AND RECORDING. (FIRST EDITION). TECHNICAL MEMORANDUM NO. 8. G. L. Hollander. Feb. 24, 1953. 36p. Contract NOrd-11799.

This bibliography contains 249 titles and abstracts of unclassified publications which appeared between 1937 and 1952 and which are applicable to the fields of data storage, recording, analog-to-digital conversion, data presentation, and telemetering. The publications are arranged alphabetically by author and chronologically for each author. Many references are of French or German origin. (ASTIA abst.)

3208 AD-30732
[David Sarnoff Research Center]
A STUDY PROGRAM ON POSSIBLE USES OF RADIOACTIVE MATERIALS IN ELECTRONIC DEVICES. FINAL REPORT [FOR JULY 1, 1951 TO NOVEMBER 30, 1953]. P. Rappaport, J. J. Loferski, and E. G. Linder. Nov. 1953. 144p. Contract AF33(038)-23686.

This final report summarizes the contract work done on the study program on possible uses of radioactive materials in electronic devices. It states the conclusions reached, and gives the evaluations of the various applications studied. The work covered studies of life expectancy, the use of processes based on ionization by collision, segregation of ions, secondary emission, reduction of work function, reduction of cathode fall, generation of anode power, effects of temperature, and low-voltage and high-voltage generators. Of these the ones found most promising, and upon which the greater part of the effort was expended, were the gereration of anode power by charging directly with beta rays, and the generation of power by the bombardment of semiconductor junctions. Devices based upon both of these processes were studied in detail both theoretically and experimentally. Both processes were concluded to be of considerable practical interest and worthy of further research and development. (auth)

3209 AD-44719
Applied Mathematics and Statistics Lab., Stanford Univ.
MULTI-LEVEL CONTINUOUS SAMPLING PLANS. TECHNICAL REPORT NO. 17. Gerald J. Lieberman and Herbert Solomon. Sept. 1, 1954. 26p. Contract N6onr-25126.

An extension of Dodge's sampling plan (Ann. Math. Stat. 14, 264-79(1943)) which allows for smoother transition between sampling inspection and 100% inspection, requires 100% inspection only when the quality submitted is quite inferior, and allows for a minimum amount of inspection when quality is definitely good is considered. This aim is accomplished by the introduction of a multi-level sampling plan which specifically allows for any number of sampling levels subject to the provision that transitions can only occur between adjacent levels. This inspection plan will be recognized as a random walk model with reflecting barriers. The first Dodge plan is easily recognized as a special case containing only one sampling level. (auth)

3210 AECU-3001
Utah Univ.
A KINETIC AND THERMODYANMIC STUDY OF THE CONTACT ANGLE. TECHNICAL REPORT NO. XII. Robert O. French, Melvin A. Cook, and Milton E. Wadsworth. Sept. 30, 1954. 20p. Contract AT(11-1)-82.

The "friction" of droplets on solids or the reluctance of a droplet (or bubble) edge to move on a solid was investigated. Velocities from 1 to 10 cm per sec were theoretically predicted for deviations of one degree from the equilibrium angle of contact of a one component liquid on a smooth solid. Experimentally, a continuum or band of equilibrium angles was observed with rather sharp receding and advancing angles, the differences 'i.e., hysteresis' of which depended on the extent of polishing. Simple, idealized, surface roughness models suggested that the observed angles were spurious with unique equilibrium angles and high edge velocities existing submicroscopically. It was pointed out that surface tensions and line tensions may be roughly estimated from heats of vaporization since the isothermal, reversible work of extension of a surface (i.e., surface tension) necessitates the breaking of intermolecular bonds. The appreciable effect of line tension on the contact angle for droplet radii less than 1000A was noted. It was shown that the range and intensity of attraction between plates 10 and 30A apart may be determined from contact angle measurements. (auth)

3211 AECU-3005
RAND Corp.
EQUATION OF STATE OF AIR ON THE STATISTICAL MODEL. Richard Latter. Sept. 21, 1954. For Los Alamos Scientific Lab. Contract [W-7405-eng-36], Subcontract SC-9. (RM-1344-AEC)

The equations of state of the oxygen, nitrogen, and argon of air were estimated separately by the Thomas-Fermi statistical model. The air mixture was then formed by adding the volumes of the components in their proper ratio corresponding to the same prescribed temperature and pressure for each. (auth)

3212 HW-30185
Hanford Works
A MATHEMATICAL APPROACH TO SURFACE DOSAGE RATE PROBLEMS. George Lewis Helgeson. Jan. 13, 1954. 14p. Contract [W-31-109-Eng-52].

Two basic equations have been presented which allow one to calculate the surface dosage rate at the center of the base of a right cylinder and at any point along the side. Curves have been presented which show the variation of dosage rates with different values of D/h. The appendix presents a tabulation of these factors for nine orders of magnitude in the ratio D/h. Sample curves of the graphical integrations required for the calculation of $f_s(D,h)$ and $f_{s,\,avg}(D,h)$ are also presented. (auth)

3213 K-1191
Carbide and Carbon Chemicals Co. (K-25)
VISCOSITIES OF THE BINARY GAS MIXTURES, METHANE—CARBON DIOXIDE AND ETHYLENE—ARGON. W. M. Jackson. Mar. 15, 1955. 14p. Contract W-7405-eng-26.

The experimental measurement of the viscosities of the binary gas mixtures methane—carbon dioxide and ethylene—argon over the composition range from 0 to 100 mole % of each component at 25°C are reported. The measured viscosities are compared with calculated values, and their application to quantitative analysis of these gas pairs is discussed. (auth)

3214 NP-5566
Institute for the Study of Rate Processes, Univ. of Utah
A SOLID-STATE MODEL FOR DETONATIONS. TECHNICAL REPORT NO. XVI. Ransom B. Parlin and J. Calvin Giddings. Jan. 1, 1955. 23p. Contract N7-onr-45103.

3215 NRL-4483
Naval Research Lab.
SLIP CASTING OF BARIUM TITANATE. [INTERIM REPORT]. J. F. Murray. [Jan. 7, 1955]. 9p.

An investigation into slip casting of barium titanate has been made because casting is the only practicable method of producing special shapes which cannot be easily pressed. From the beginning it was clear that a good deflocculant was needed, and much of the investigation was devoted to the development of such a mixture. As a result of this study, a deflocculant was prepared, and this mixture produced good ceramic specimens from a wide variety of raw materials. The casting slip was prepared from barium titanate, distilled water, and deflocculant by mixing them in a ball mill charged with flint pebbles. After de-airing, the slip was cast into two-piece or three-piece plaster molds. Materials from one commercial source were all fabricated easily by this method, but those made at the Laboratory were sometimes difficult to cast. At first the pH of the slip appeared to be critical. Adjustment, however, often required so much time that considerable grinding was involved, and it became apparent that the change in particle size was more important than the change in pH. Investigation showed a direct relation between particle size, ease of fabrication, and the properties of the finished specimens. It further appears that the optimum particle size distribution for slip casting differs from that for dry pressing. Excellent results have been obtained over a rather wide pH range, so that extremely careful pH adjustment no longer seems necessary. Specific gravity was used to follow and control the water content of the slip; the weight of water was generally about fifteen percent of the weight of the barium titanate. No correlation was made between casting qualities and the nature and amount of water-soluble impurities in the material. (auth)

3216 PA-TR-1898
Pacatinny Arsenal
MECHANICAL PROPERTIES OF RIGID PLASTICS AT LOW TEMPERATURES. Henry A. Tisch. May 1954. 143p. (AD-33305)

Fifty-six different rigid plastics which comprise a representative selection from all of the currently available commercial types are reported. The properties are tensile modulus of elasticity, proportional limit, elongation at break, ultimate tensile strength, work-to-produce failure, and Izod impact strength. The properties were determined at + 77°, + 10°, and −40°, and −65°F. Quantitative data for design purposes and a uniform basis for quantitative comparisons between a much larger number of materials than was previously possible are given. The data also provide quantitative information on the effect of temperature on each of these materials. The data were obtained under conditions of constant rate of load increase. This condition more closely resembles the conditions encountered in most Ordnance applications than does the condition of constant rate of elongation which has generally been used in investigations conducted in other laboratories. Most of the results obtained are qualitatively in agreement with expectations and with previously reported investigations. In a few instances, results were quite contrary to all expectations. (auth)

3217 AEC-tr-2098
THE KINEMATIC STRUCTURE OF BREAK-AWAY CAVITATION ON A CIRCULAR PROFILE. K. K. Shal'new. Translated by E. R. Hope from Doklady Akad. Nauk 97, 785-8(1954). 9p. (AEC-tr-2098)

A study of break-away cavitation on a circular profile was made with high-speed motion pictures in a miniature hydrodynamic cavitation tunnel, the cavitation taking place on the walls of diffusors and on surface irregularities. (J.E.D.)

3218
NEUTRON DIFFRACTION OBSERVATIONS ON THE SUPERCONDUCTING STATE. M. K. Wilkinson, C. G. Shull, L. D. Roberts, and S. Bernstein (Oak Ridge National Lab., Tenn.). Phys. Rev. 97, 889-91(1955) Feb. 15.

Neutron diffraction patterns for vanadium, lead, and niobium have been obtained above and below their superconducting transition temperatures. No diffraction effects either of coherent or incoherent nature were found to result from the development of superconductivity. Accurate intensity measurements of the nuclear scattering reflections indicate little or no change in the Debye characteristic temperature of the lattice upon passage through the superconducting transition. (auth)

3219
SUPERCRITICAL DAMPING OF OSCILLATING DISKS IN LIQUID HELIUM II. J. G. Dash (Los Alamos Scientific Lab., N. Mex.). Phys. Rev. 97, 1038-42(1955) Feb. 15.

The damping of a torsion pendulum in liquid He II, for relative velocities exceeding the critical velocity, is calculated from the phenomenological theory of superfluid dynamics. The logarithmic decrement of a single disk and of an array of thin disks are treated with some simplifying assumptions and compared with the observations of Hollis-Hallett. Quantitative comparison indicates that the strength of the supercritical ρ_s-wall interaction is given by $k = 8 \times 10^{-3} a^{-1/2}$ g cm^{-4} over a considerable range of a. (auth)

3220
SPECIFIC HEATS OF PURE ^{4}He AND OF A MIXTURE OF ^{4}He WITH 2.50% OF ^{3}He BETWEEN 1°K AND 2.3°K. Z. Dokoupil, G. Van Soest, D. H. N. Wansink, and D. G. Kapadnis (Kamerlingh Onnes Lab., Leiden, Netherlands). Physica 20, 1181-8(1954) Dec. (In English)

A method for the determination of the heat capacity of small quantities of isotopic mixtures of liquid helium has been developed and used also for the measurement of the specific heat of He^4. The scattering of the experimental points within 4% along the smoothed curve given by Kramers, Wasscher and Gorter confirms their results. The same experimental setup has been used for the determination of the specific heat of mixture of ^{4}He with 2.50% of ^{3}He between 1.05 and 23°K. With respect to pure ^{4}He an appreciable increase of the heat capacity of the mixture (about 40% at 1.1°K, the relative increase diminishing with the rise in temperature) and a shift of the λ-temperature of 0.037 degK has been found as a result of three series of measurements. (auth)

3221
THE LOW TEMPERATURE HEAT CAPACITY AND ENTROPY OF CADMIUM IODIDE. A. S. Dworkin, D. J. Sasmor, and E. R. Van Artadalen (Oak Ridge National Lab., Tenn.). J. Am. Chem. Soc. 77, 1304-6(1955) Mar. 5.

The heat capacity of crystalline cadmium iodide has been measured between 15 and 300°K. At 298.16°K $C_p = 19.11$ cal/mole-deg and $S^0 = 38.5$ eu of which 1.5 eu has been obtained by extrapolation below 15°K. Heat capacity, entropy, and certain derived thermodynamic quantities are tabulated at 10° intervals up to 300°K. The heat capacity of cadmium iodide rises so rapidly at very low temperatures that near 15°K it varies approximately as $T^{1.4}$. Nowhere above 15°K does the heat capacity follow either the Debye T^3 law or the T^2 relationship shown by certain substances which have layer lattice structure. (auth)

3222

MASS TRANSFER. C. R. Wilke (Univ. of California, Berkeley). Ind. Eng. Chem. 47, 658-64(1955) Mar.

This review includes references on molecular diffusion in gases and liquids, turbulent diffusion, mass transfer resistance in one phase and two phases, interfacial resistance, mass transfer to and within solids, and diffusive separation processes. 64 references. (L.T.W.)

3223

BIBLIOGRAPHY AND INDEX ON DYNAMIC PRESSURE MEASUREMENT. W. G. Brombacher and T. W. Lashof. Natl. Bur. Standards (U. S.) Circ. 558, Feb. 14, 1955. 124p. $0.75 (GPO)

This circular contains a bibliography of 850 items on dynamic pressure measurement and, in less detail, on related subjects such as static pressure measurement and general information on the components of instruments. An index of the bibliography by both subject and author is included. (auth)

3224

QUANTUM THEORY OF LINE BROADENING BY AN IONIC PLASMA. H. Margenau (Yale Univ., New Haven, Conn.) and R. Meyerott (Argonne National Lab., Lemont, Ill.). Astrophys. J. 121, 194-203(1955) Jan.

It is shown how Holtsmark's theory is related to first principles of line broadening, and its connection with other so-called "statistical" theories is indicated. The quantum-mechanical derivation is restricted to perturbations by a single ion but retains the terms which correspond to the nonuniformity of the field. Ions and electrons are treated simultaneously, and the shifts caused by the electrons are computed in a simple manner. Unpublished work dealing with line broadening by electrons, not included in this paper, is briefly summarized; it is noted that broadening as well as shifts by electrons amount to only a few per cent of the ion width. While the method employed is applicable to all hydrogen lines, the details are given only for the Lyman-α line. (auth)

3225

ABSTRACTS OF THE LITERATURE ON SEMICONDUCTING AND LUMINESCENT MATERIALS AND THEIR APPLICATIONS. 1953 ISSUE. Battelle Memorial Institute, comp. New York, John Wiley and Sons, Inc., 1955. 169p. $5.00

3226

ORIGIN AND AGE OF METEORITES. Harold C. Urey (Univ. of Chicago, Ill.). Nature 175, 321-3(1955) Feb. 19.

It seems probable that at least most of the meteorites, stones, irons and stony irons have not been heated markedly since the solar system was formed some 4.5 to 5 × 10^9 years ago, and that the processes by which they were formed were indeed part of the early history of the solar system. The ages of iron meteorites determined by the helium method are probably in error because of a leak of the radiogenic helium. This helium was produced in silicate or sulphide (?) inclusions, and hence leaked more or less rapidly along fissures which are present in these objects. (auth)

3227

X-RAY CRITICAL-ABSORPTION AND EMISSION ENERGIES IN KEV. S. Fine and C. F. Hendee (Philips Labs., Irvington on Hudson, N. Y.). Nucleonics 13, No. 3, 36-7(1955) Mar.

A table is presented of energy values of K and L absorption and emission series for all elements. Most values were obtained by a conversion to kev of tabulated experimental wavelength values. The conversion equations relating energy and wavelength are given. (M.P.G.)

3228

FEEDBACK CONTROL SYSTEMS. Gilbert Howard Fett (Univ. of Illinois, Urbana). New York, Prentice-Hall Inc., 1954. 361p.

This book is intended to serve the needs of the advanced engineering student and practicing engineer in industry who wish a basic understanding of feedback systems and methods for solving newer problems in this field. (auth)

3229

GRAPH-ANALYTICAL METHODS OF FINDING THE TRAJECTORIES OF RELATIVISTIC CHARGED PARTICLES IN ELECTROSTATIC FIELDS. A. M. Strashkevich. Zhur. Tekh. Fiz. 23, No. 10, 1796-1801(1953). (In Russian)

Three methods are discussed and a table is given of the results obtained when they were applied to the case of a uniform field. Exact results are also given for comparison. (Science Abstr.)

3230

THE LUMINESCENCE OF KBr–Ni AND KBr–Cu PHOSPHORS EXCITED BY X-RAYS. I. A. Parfianovich. Zhur. Ekspt'. i Teoret. Fiz. 25, No. 5, 614-20(1953). (In Russian)

An extension to KBr–Ni and KBr–Cu of previous experiments is reported using the same experimental arrangement. Peaks in the curves of luminescence against temperature from 160 to 400°K reveal the participation of different levels of electronic excitation. Their relative heights depend on the temperature at which the irradiation had taken place. Irradiation by infrared light prior to taking the luminescence-temperature curves enriches the lower levels. A study of the dependence of the intensity of luminescence of KBr–Ni at room temperature on the time after the cessation of the irradiation of the excited phosphors by infrared light shows a sharp drop to a minimum (at 100 sec), then a slow rise to a maximum (at 500 sec), followed by an exponential decay (out to 4000 sec). The rise can be understood in terms of a mechanism of recombination involving a rise in the number of ionized centers of luminescence. Its kinetics are studied in a simple mathematical form. (Science Abstr.)

3231

RADIUM AND THORIUM X IN SOME POTABLE WATERS. A. F. Stehney (Argonne National Lab., Lemont, Ill.). Acta Radiol. 43, 43-51(1955) Jan.

Water from wells which penetrate into the Galesville sandstone of Cambrian age at a depth of approximately 1,500 feet near Chicago, Illinois was found to contain from 3 to 8 μμc Ra^{226} per liter and similar concentrations of Ra^{224}. This is believed to be the highest authenticated concentration of radium found to date for any drinking water in the United States. The combined population of the communities using these wells is over 100,000. Drinking water from Frankfurt am Main, Germany was found to contain less than 0.3 μμc Ra^{226} per liter as compared to more than 300 μμc per liter previously reported. Less than one $\mu\mu c$ of total alpha activity per liter was found in water from Pittsburgh, Pennsylvania, although 143 $\mu\mu c$ Ra^{226} per liter had been reported. (auth)

AEROSOLS

3232

SIZE REDUCTION. Lincoln T. Work. Ind. Eng. Chem. 47, 585-9(1955) Mar.

This review includes references on general studies on size reduction, size measurement of powders and aerosols, grinding mills, classification, and applications. 202 references. (L.T.W.)

COSMIC RADIATION

3233

ON A THEORETICAL OUTLINE FOR THE ORIGIN OF COSMIC RADIATION. Jean Heidmann. Compt. rend. 240, 511-13 (1955) Jan. 31. (In French)

A theory is proposed on the origin of cosmic rays which provides for the acceleration of particles by an electromotive force induced within the galaxy by the Magellanic Clouds. An energy of 10^{15} ev can be attained. (tr-auth)

3234

EVALUATIONS OF THE SCATTERING ANGLE, INTENSITY INCREASE AT HIGH LATITUDES, AND THE RELATIVE NUMBER OF SLOW SECONDARY NUCLEONS IN THE ATMOSPHERE. Tsai-Chu and Max Morand. Compt. rend. 240, 513-15(1955) Jan. 31. (In French)

The mean scattering angle by collision between primary and secondary is about 4.4°. It is possible to have an increase in secondary intensity of 6.5% at latitudes above 46°10′. The relative number of secondary nucleons which remain after a large thickness of air increases with the primary energy. (tr-auth)

3235

STUDY OF THE ABSORPTION MEAN FREE PATH OF THE NUCLEAR COMPONENT OF COSMIC RADIATION IN A SENSITIVE EMULSION. Yvette Avignon and Simone Desprez-Rebaud. Compt. rend. 240, 515-17(1955) Jan. 31. (In French)

The mean free path for absorption of protons of energy less than 190 Mev, between 1920 and 160 m, was found to be 123 ± 5 g/cm^2 of air. (tr-auth)

3236

K-MESONIC DECAY OF A SLOW SECONDARY PARTICLE. W. F. Fry, J. Schneps, and M. S. Swami (Univ. of Wisconsin, Madison). Phys. Rev. 97, 1189-90(1955) Feb. 15.

In the course of a systematic search in cosmic-ray plates for excited nuclear fragments, an event was found where a K meson was ejected from a small secondary star. The primary star was of the type (21 + 9N). The secondary star was connected to the primary star by a short saturated track. The secondary star had three prongs: a recoil track, a track produced by a proton, deuteron, or a triton, and a K-meson track. (L.T.W.)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3237

Al—Th INTERMETALLIC COMPOUNDS. II. P. B. Braun and J. H. N. van Vucht (Philips Research Labs., Eindhoven, Netherlands). Acta Cryst. 8, 117(1955) Feb.

The existence of six intermetallic compounds of Al—Th is reported. The Al_3Th, Al_2Th, and Al_2Th_3 systems are described. (C.H.)

3238

X-RAY AND NEUTRON DIFFRACTION STUDY OF FERRO-ELECTRIC $PbTiO_3$. Gen Shirane and Ray Pepinsky (Pennsylvania State Univ., State College) and B. C. Frazer (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 1179-80(1955) Feb. 15.

GASES

3239 TT-456

LIMITED MUTUAL SOLUBILITY OF GASES AT HIGH PRESSURES IN THE SYSTEMS HELIUM—AMMONIA AND HELIUM—CARBON DIOXIDE. (Organichennaya Vzaimnaya Rastvorimost' Gazov Pri Vysokikh Davleniyakh V Sistemakh Gelii—Ammiak i Gelii—Uglekislyi Gaz). D. S. Tsiklis. Translated by G. Belkov from Doklady Akad. Naul S.S.S.R. 86, 1159-61(1952). 5p.

3240

THERMAL RELAXATION IN GASES. Robert Brout (Colum bia Univ., New York). J. Chem. Phys. 22, 1500-2(1954) Se

The solution of the linearized equations appropriate for sound dispersion is presented. The limiting cases as the sound frequency becomes large or small is examined. The two state gas is exhibited as a special case and shown equi alent to previous work in the field when the appropriate assumptions are made. (auth)

3241

EMISSION OF ULTRAVIOLET RADIATION IN GASEOUS MIXTURES EXPOSED TO THE ACTION OF α PARTICLES. Solange Lormeau-Loustau. Compt. rend. 240, 768-70(1955 Feb. 14. (In French)

The intensity of radiation emitted by α reactions in gaseous mixtures is not always the sum of intensities corresponding to each gas. The loss of photons implies a reactio between the constituents of the mixture. Measurements were made with O_2, N_2, and H_2. (K.S.)

INSTRUMENTS

3242 ISC-578

Ames Lab.

AN ACCURATE DIGITAL COUNT-TO-ANALOG VOLTAGE CONVERTER EMPLOYING A RELIABLE DECADE SCALER. W. A. Rhinehart, D. J. Zaffarano, and R. C. Prior. Feb. 10, 1955. 15p. Contract W-7405-eng-82.

A decade scaling circuit of unusual design is connected to operate relays which switch current increments into an output resistor, yielding an IR voltage proportional to the absolute count. This permits the use of a strip chart recorder to plot automatically the information received. The accuracy of conversion is limited only by the accuracy of the components in the circuit. The scaling circuit can be built with a resolving time of 0.8 μsec. (auth)

3243

AUTOMATIC VACUUM PUMP CONTROL CIRCUIT. B. G. Childs and J. Penfold (Atomic Energy Research Establishment, Harwell, Berks, England). Rev. Sci. Instr. 26, 235-6 (1955) Feb.

A vacuum pump control circuit is described and illustrat diagrammatically which was designed so that, using standard commercial components, the reservoir may be pumped down automatically whenever the pressure in it rises to a particular preset limit. The system can, if desired, be operated manually. (C.H.)

3244

PRECISION 5-10 KV HIGH-VOLTAGE SUPPLY. Louis Costrell (National Bureau of Standards, Washington, D. C.). Nucleonics 13, No. 3, 63-4(1955) Mar.

A highly regulated positive-polarity high-voltage supply suitable for use with ionization chambers is described. The supply delivers up to 250 μa at 5 to 10 kv in steps of 1 kv. The drift over several days is about 100 parts per 10^6. Ripple is about 30 mv rms. A circuit diagram is given. (M.P.G.)

ISOTOPES

3245

RADIOISOTOPE PRODUCTION RATES IN A 22-MEV CYCLOTRON. John A. Martin, Robert S. Livingston, Raymond L. Murray, and Mozelle Rankin (Oak Ridge National Lab., Tenn.). Nucleonics 13, No. 3, 28-32(1955) Mar.

For producing radioisotopes, the cyclotron complements rather than competes with the nuclear reactor. Cyclotron-produced isotopes usually decay by electron capture and positron emission, while reactor-produced isotopes usually decay by negatron emission. Cyclotron-produced isotopes are not much more expensive than those produced in a reactor, since in both cases production costs are usually small compared to decay losses and processing and shipping costs. The production of isotopes in the ORNL 86 in. cyclotron is described. Actual production rates are given for 14 isotopes. Yields have been estimated for 136 carrier-free radioisotopes with half lives greater than 100 min produced by (p,n) and (p,2n) reactions. The method used to calculate the yields is described. (M.P.G.)

ISOTOPE SEPARATION

3246

A LABORATORY METHOD FOR SEPARATING NITROGEN ISOTOPES BY ION EXCHANGE. F. H. Spedding, J. E. Powell, and H. J. Svec (Iowa State Coll., Ames). J. Am. Chem. Soc. 77, 1393(1955) Mar. 5.

3247

STUDIES IN NUCLEAR SPECTROSCOPY WITH ELECTROMAGNETICALLY SEPARATED GASEOUS ISOTOPES. I. ISOTOPE SEPARATOR AND SAMPLE PREPARATION. Sigvard Thulin. Arkiv Fysik 9, No. 2, 107-36(1955).

The isotope separator is briefly discussed. Recent improvements have increased the resolving power which is now about 550 with ion currents of several μa. The collection of stable gas isotopes is discussed, mainly with reference to experience gained with the present separator. A study of saturation phenomena occurring when rare gas isotopes are collected in metal surfaces has been undertaken. Preliminary measurements show that the maximum amount of gas which can be collected in this way is very sensitive to the beam intensity at the collector. Sputtering of target material and backscattering of energetic ions from the target were found to be negligible under the experimental conditions given. The preparation of active isotopic samples for nuclear spectrometer measurements is discussed. Usually, aluminium foils of thickness 0.15 mg/cm^2 have been used as collectors. It is shown that active rare gas isotopes can be collected in formvar films of thickness 2 μg/cm^2, but the collection efficiency was, in this case, very small. The temperature stability of gaseous targets prepared by ion bombardment of metal surfaces has been studied. Rare gas targets were found to be stable below 200°C. Measurements of this kind may give information about the diffusion of gases in metals. 67 references. (auth)

MASS SPECTROGRAPHY

3248 PDB-147

Chalk River Project (Canada)

THE ANALYSIS OF HYDROGEN—TRITIUM MIXTURES ON THE CONSOLIDATED-NIER MASS SPECTROMETER. R. W. Jones. Dec. 28, 1954. 14p.

A series of experiments have been carried out on the equilibration of H_2-T_2 mixtures. The effect of various catalysts on promoting the reaction between the different molecular species was determined in an attempt to find a suitable method for preparing standard samples with which to calibrate the mass spectrometer. (auth)

MATHEMATICS

3249

COMPUTERS, STATISTICS, AND MATHEMATICS. Arthur Rose (Pennsylvania State Univ., State College), R. Curtis Johnson (Washington Univ., St. Louis, Mo.), and Richard L. Heiny (Dow Chemical Co., Midland, Mich). Ind. Eng. Chem. 47, 626-32(1955) Mar.

The application of computers, statistics, and mathematics to problems in chemistry and chemical engineering is reviewed. 130 references. (L.T.W.)

MEASURING INSTRUMENTS AND TECHNIQUES

3250 AD-34974

Tracerlab, Inc.

INTERIM ENGINEERING REPORT FOR NEUTRON SURVEY EQUIPMENT. (PHASE II). R. Bersin. Mar. 1954. 11p.

The design of three electronic components for neutron survey equipment is described. Circuit diagrams and design details are presented for a pulse integrator, a d-c amplifier and output adder, and a high voltage supply. Design of the ionization chamber will be described in a later report. (M.P.G.)

3251 AECU-3006

David Sarnoff Research Center

ELECTRONIC DEVICES FOR NUCLEAR PHYSICS. QUARTERLY REPORT NO. 18 [FOR] NOVEMBER 1, 1954—JANUARY 31, 1955. R. H. Anderson, M. H. Greenblatt, and A. H. Sommer. (This report also covers work on photoelectric emission which is not included in the contract, and was done by: A. L. Solomon and A. H. Sommer). Feb. 4, 1955. 21p. [For Oak Ridge National Lab.] Contract W-7405-eng-26, Subcontract 308.

Further studies are reported on the mechanism of photoemission and the development of high-current and high-speed photomultiplier tubes. (For preceding report in series see AECU-2980.) (K.S.)

3252 CVAC-262T

Consolidated Vultee Aircraft Corp.

AN INVESTIGATION OF THE OPERATING CHARACTERISTICS OF THE FAST NEUTRON DOSIMETER. J. T. Bracken, E. A. Rollor, and J. A. Mohrbacher. July 26, 1954. 79p. (MR-N-50)

Basic problems of neutron dosimetry are reviewed. Design of a fast neutron dosimeter is reported, and studies of the operating characteristics of the dosimeter are described in detail. (C.H.)

3253 UCRL-2865
Radiation Lab., Univ. of Calif., Berkeley
A 36-ATMOSPHERE DIFFUSION CLOUD CHAMBER.
John B. Elliott, George Maenchen, Peter H. Moulthrop, Larry O. Oswald, Wilson M. Powell, and Robert W. Wright.
Feb. 18, 1955. 9p. Contract W-7405-eng-48.

A 36-atmosphere diffusion cloud chamber has been constructed for use with the 184-inch cyclotron and with the bevatron. Minimum-ionizing particles leave dense, sharp tracks of good contrast with hydrogen filling at design pressure. In the operation described, one event is obtained every 15 minutes for a reaction cross section of 30 mb for negative pions on hydrogen. Among the unique features of the chamber are (a) the high pressure; (b) the high magnetic field; (c) the simple unit preassembly of the chamber and the upper pole piece; (d) the distortion-free photography afforded by the small camera windows of good optical quality directly in front of the camera lenses, and the absence of a large top glass near the sensitive region; (e) the thin window for collimated beams; (f) the supported cast Astrolite windows for illumination; and (g) the satisfactory sensitive layer obtained despite the large height-diameter ratio of the pressure vessel. (auth)

3254
AN ATLAS OF TYPICAL EXPANSION CHAMBER PHOTOGRAPHS. W. Gentner, H. Maier-Leibnitz, and W. Bothe. London, Pergamon Press, 1954. 199p.

3255
APPARATUS FOR CARBON-14 DATING. C. Ballario, M. Beneventano, A. De Marco, F. Magistrelli, C. Cortesi, and T. Mantovani (Univ. of Rome). Science 121, 409-12(1955) Mar. 25.

A simplified apparatus based on that developed by W. F. Libby and his colleagues is described for dating activity by the C^{14} method. Control measurements on a piece of wood from the Roman ships at Lake Nemi, Rome, and on a piece of charcoal found in an Etruscan tomb near Cerveteri, Italy, gave good agreement with estimated ages. (C.H.)

3256
A DEVICE FOR THE MEASUREMENT OF DOSE AS A FUNCTION OF SPECIFIC IONIZATION. Harald H. Rossi and Walter Rosenzweig (Columbia Univ., New York). Radiology 64, 404-11(1955) Mar.

The performance of ionization chambers operated as proportional counters for determinations of the total energy imported to tissue by ionizing radiations is discussed. (C.H.)

3257
FISSION CHAMBERS FOR NEUTRON DETECTION. R. Aves, D. Barnes, and R. B. MacKenzie (Atomic Energy Research Establishment, Harwell, Berks, England). J. Nuclear Energy 1, 110-16(1954) Dec.

Constructional details and operational characteristics of two groups fission chambers are discussed. The first group includes cylindrical chambers of length from 1 to 6 in. and diameter $^{1}/_{4}$ to 1 in. over-all. The second group are of large annular construction 6.9 in. in length, 6.15 in. in internal diameter, and 6.9 in. external diameter. Fissionable materials (natural U, U enriched or depleted in U^{235}, and Pu^{239}) are deposited on a set of closely spaced interleaved coaxial Ni cylinders which form the electrodes of the chamber. Pure A up to 10 atm. pressure is used as the filling gas. The chambers are normally operated at a potential difference of 300 to 500 volts, with sufficiently short time constants to allow electron collection only. (L.M.T.)

3258
ELECTRICAL CHARACTERISTICS OF FISSION CHAMBERS. J. E. R. Holmes, D. D. McVicar, L. R. Shepherd, and R. D. Smith (Atomic Energy Research Establishment, Harwell, Berks, England). J. Nuclear Energy 1, 117-23(1954) Dec.

A brief discussion is given of the factors affecting the performance of the fission chambers described in a separate paper (see preceding abstract). Operating conditions and bias curves are given. (auth)

3259
BROMINE-QUENCHED AND IODINE-QUENCHED GEIGER-MÜLLER COUNTERS. Gosta Brogren. Arkiv Fysik 9, No. 2, 101-5(1955)

3260
SCINTILLATION SPECTROMETRY OF LOW-ENERGY BREMSSTRAHLUNG. Margarete Ehrlich. J. Research Natl. Bur. Standards 54, 107-18(1955) Feb.

A method was devised to measure bremsstrahlung spectra from commercial x-ray tubes on an absolute scale, using a thallium-activated sodium-iodide crystal-scintillation spectrometer. The method was used to study bremsstrahlung spectra between 20- and 100- kilovolts exciting potentials from a beryllium window tube having a thick tungsten target. Fully corrected, absolute experimental spectra were obtained at exciting potentials of 50 and 100 kilovolts. In order to compare the experimental results with theory, a calculation was made yielding the thick-target bremsstrahlung spectrum derived from Sommerfeld's theory. Experiment and theory showed order-of-magnitude agreement. However, a characteristic difference in spectral shape was observed, the experimental spectra showing a more pronounced peak. This peak is near 30 kilo electron volts and gives the impression of being superimposed on the spectral shapes expected from theory. Finally, a point of interest to the practical user of the x radiation from beryllium window tubes was brought out, namely, that a considerable portion of the low-energy radiation, at least in the region between 12 and 30 kilo electron volts, is strongly absorbed in the tungsten target of a conventional x-ray tube. (auth)

3261
MAPPING RADIATION FIELDS WITH SILVER-ACTIVATED PHOSPHATE GLASS. Herbert Rabin and William E. Price (U. S. Naval Research Lab., Washington, D. C.). Nucleonics 13, No. 3, 33-5(1955) Mar.

Gamma ray fields above 200 kev can be measured easily and reliably by means of silver-activated phosphate glass. The glass is available in small specimens and can be mounted on any surface with adhesive tape. Optical absorption changes in the glass are measured with a spectrophotometer. The field of the NRL Co^{60} source was mapped using silver-activated glass. The results compared well with computed dose rates using a line-source approximation. A method for correcting the glass for fading during exposure is presented. (M.P.G.)

3262
SPECIFIC-ACTIVITY DETERMINATION WITH BETA AND UV-PHOTON COUNTER. T. D. Price and P. B. Hudson

(Columbia Univ. Coll. of Physicians and Surgeons and Francis Delafield Hospital, New York). Nucleonics 13, No. 3, 54-8(1955) Mar.

A method is described for determining the specific activity of a labeled compound initially present in admixture with other labeled compounds. Papergrams developed with appropriate chromatographic solvents or electrophoresis are immobilized and the activity of the deposits measured. Serial fractions containing β radiation are delineated by a Pb or Pt mask with appropriate apertures. Light radiation is transmitted from a lamp through the paper, and if the radioactive compound under study absorbs ultraviolet light, or can be caused to do so by a reaction in the paper, all measurements for evaluating the radiochemical purity and determining specific activity are easily made by using a counting tube with gas phase sensitive to β radiation and cathode sensitive to ultraviolet photon radiation. Equipment and procedures are described. (C.H.)

3263

4π BETA COUNTER FOR SCANNING PAPER CHROMOTOGRAMS. A. Harrison and F. P. W. Winteringham (Pest Infestation Lab., Slough, Bucks, England). Nucleonics 13, No. 3, 64-8(1955) Mar.

A 4π β counter is described which gave satisfactory performance for the determination of labeled compounds separated on paper chromatograms. (C.H.)

3264

USING A SCINTILLATION SPECTROMETER FOR DETERMINING URANIUM BURNUP. J. H. Kittel (Argonne National Lab., Lemont, Ill.). Nucleonics 13, No. 3, 70-2(1955) Mar.

A method is described which uses a simple chemical separation and a scintillation spectrometer to determine total fissions in neutron irradiated fissionable material such as natural uranium. (C.H.)

3265

A NONSATURABLE HIGH-ENERGY BEAM MONITOR. G. W. Tautfest and H. R. Fechter (Stanford Univ., Calif.). Rev. Sci. Instr. 26, 229-31(1955) Feb.

A monitor for high-energy beams of charged particles utilizing the phenomenon of secondary emission is described. The primary beam to be monitored passes through a set of foils alternately phased in voltage. The current produced by secondary electrons ejected by the beam passage is collected onto the one set of foils and measured. Results of tests with high-energy electrons are given. The monitor gives no indication of saturation up to peak current densities of 16 ma/cm^2, and is independent of the primary beam energy in the range over which the monitor was tested (111 to 235 Mev). (auth)

3266

A RADIOACTIVE-CONTAMINATION MONITOR FOR THE HANDS, FEET, AND CLOTHING. A. Nemet, R. B. Stephens, and W. A. Bayfield (Philips Balham Works Ltd., London). Philips Tech. Rev. 16, 201-10(1955) Jan.

Design details and measuring circuits are described for a personnel contamination monitor which combines in one instrument detectors for α contamination on hands, α contamination on clothing, β or γ contamination on hands, β or γ contamination on clothing, and γ contamination of feet. (C.H.)

3267

GAMMA DOSIMETRY OF A NUCLEAR REACTOR BY IRRADIATION OF FERRINE. Jacques Pucheault. Compt. rend. 240, 772-4(1955) Feb. 14. (In French)

A procedure is described for investigating the γ radiation from a reactor by measuring the extent of ferrine (ferric orthophenanthrolene) reduction. Results with the Chatillon pile are in good agreement with ionization chamber measurements. (K.S.)

3268

ALPHA HAZARD MONITORING INSTRUMENTS. Duncan A. Holaday (Division of Special Health Services, Salt Lake City, Utah). Am. Ind. Hyg. Assoc. Quart. 16, 60-3(1955) Mar.

The various pitfalls that may be encountered during the course of an alpha-monitoring survey have been discussed. The information that can be obtained has also been pointed out, and some consideration has been given to instrument design. (auth)

MESONS

3269

CHARGE AND ISOTOPIC-SPIN CONSERVATION IN MULTIPLE MESON PRODUCTION. Yehudah Yeivin (Weizmann Inst. of Science, Rehovoth, Israel). Phys. Rev. 97, 1084-5 (1955) Feb. 15.

General formulas are derived for the corrections to Fermi's cross sections, which follow from the conservation of (a) charge, or (b) charge plus isotopic spin. The possible identify of some of the particles which appear after a nucleon-nucleon collision is also taken into account. It turns out that there is only a slight difference between results calculated under assumption (a) or (b). (auth)

3270

PRODUCTION OF NEUTRAL V-EVENTS BY COSMOTRON NEUTRONS. R. M. Walker, R. S. Preston, E. C. Fowler, and H. L. Kraybill (Yale Univ., New Haven, Conn.). Phys. Rev. 97, 1086-92(1955) Feb. 15.

Approximately 2000 cloud chamber pictures have been taken in the forward beam of neutrons produced by high-energy protons striking a beryllium target in the cosmotron. Nine V events interpreted as the decay of a neutral particle produced in a one-inch lead plate in the cloud chamber, were observed. The neutron flux is estimated, from stars observed in the argon gas of the chamber, to be 140 per picture. An upper limit to the cross section for Λ^0 production of 3 millibarns per lead nucleus is deduced for the meson-producing neutrons. (auth)

3271

ON THE MASS DETERMINATION OF UNSTABLE HEAVY PARTICLES BY PHOTOMETRY OF TRACKS IN NUCLEAR EMULSIONS. Lud van Rossum. Compt. rend 240, 747-9 (1955) Feb. 14. (In French)

Statistical fluctuations and uncertainties in the track density are compared with precision actually obtained. The results indicate that an important part of the heavy mesons present in a group of plates have a mass between 950 and 1,100 m_e. (K.S.)

3272

OBSERVATIONS ON NEGATIVE K-MESONS. M. W. Friedlander, D. Keefe, and M. G. K. Menon (Univ. of Bristol, England), R. H. W. Johnston and C. O'Ceallaigh (Institute for Advanced Studies, Dublin, Ireland), and A. Kernan (Univ. Coll., Dublin, Ireland). Phil. Mag. (7) 46, 144-9(1955) Feb.

Three examples of negative heavy mesons which produce nuclear disintegrations at the end of their ranges in emulsion, are described. Certain characteristics of the parent and capture stars of these mesons are discussed. (auth)

3273

ON THE SPIN OF THE θ^0 MESON. P. T. Matthews (Univ. of Birmingham, England) and Abdus Salam (St. John's Coll., Cambridge, England). Phil. Mag. (7) 46, 150-4(1955) Feb.

The θ^0 meson may be a scalar or a vector particle. The possible interactions which account for its decay into two π mesons are considered. The cross sections (a) for the anomalous decay of θ^0 into two π mesons and a γ ray and (b) for the production reaction $\pi^- + p \rightarrow \Lambda^0 + \theta^0$, are calculated, in the hope of finding a criterion to distinguish between the two spin values. (auth)

METEOROLOGY

3274

THERMONUCLEAR EXPLOSIONS AND THE WEATHER. Graham Sutton. Nature 175, 319-21(1955) Feb. 19.

Available evidence indicates that the recent man-made nuclear disturbances over the Pacific are not responsible for any world wide extremes of weather. (J.E.D)

MOLECULAR PROPERTIES

3275 OSR-TN-54-81

Forrestal Research Center, Princeton Univ.

STABILIZATION OF ENERGY-RICH MOLECULES. I. ENERGY TRANSFER WITH HYDROGEN. TECHNICAL NOTE NO. 6. M. Boudart and J. T. Dubois. May 1954. 35p. Contract AF33(038)-23976. (AD-42797)

The increase in fluorescence yield of β-naphthylamine vapors in the presence of foreign gases provides a new powerful method for studying energy exchange. The effect, discovered by Neporent, is analyzed kinetically, and the analog of the Stern-Volmer equation for this effect is derived. Neporent's data are recalculated in the light of this analysis. Fluorescence stabilization by deuterium and sulfur hexafluoride is studied experimentally following the procedure of Neporent. It is concluded, in particular, that the vibrational and rotational modes of the hydrogen molecules are inactive in the excitation or deexcitation of vibrational energy of complex molecules. (auth)

NUCLEAR PHYSICS

3276

NUMERICAL TABLES OF NUCLEAR PHYSICS. Charles Noel Martin. Paris, Gauthier-Villars, 1954. 258p. (Text in both English and French)

Fourteen tables of nuclear data have been compiled in two parts. Part I consists of 6 tables giving data on atomic masses, α and β disintegration energies, and binding energies for nuclei of A varying from 10 to 280 and Z from 2 to 115. Weizsäcker's formula is used as a basis for these tables. Part II is a group of 8 tables dealing with nuclear radii, reaction thresholds, disintegration energies, Coulomb barriers of stable nuclei, and conversion factors. (K.S.)

NUCLEAR PROPERTIES

3277

MASSES OF LIGHT NUCLEI. J. E. Drummond (Department of Scientific and Industrial Research, Wellington, New Zealand). Phys. Rev. 97, 1004-7(1955) Feb. 15.

Values for the atomic masses of 42 nuclei from n^1 to S^{34} are derived from data on 110 nuclear reactions and mass spectrographic doublets. A variance-covariance matrix for the results is also derived and a further 32 masses in the same region are included. These results are found to be consistent with most of the data available. (auth)

3278

GYROMAGNETIC RATIO OF AN EXCITED STATE AND OTHER ANGULAR CORRELATION MEASUREMENTS FOR Pb^{204m}. V. E. Krohn and S. Raboy (Argonne National Lab., Lemont, Ill.). Phys. Rev. 97, 1017-22(1955) Feb. 15.

The spin assignment, 9-4-2-0, for the levels of the triple cascade of Pb^{204m} has been found consistent with angular correlation measurements provided the first and second gamma rays are multipole mixtures. The first gamma ray must be E5 with a one percent mixture of M6, and the second gamma ray must be E2 with 0.5 percent M3. The gyromagnetic ratio of the 2.6×10^{-7} sec state was measured by angular correlation techniques, and the result, $g = +0.054 \pm 0.005$ nuclear units, was obtained. If one assumes the validity of the spin 4 assignment for this state, the magnetic moment is 0.22 ± 0.02 nuclear magnetons. An attempt to observe time-dependent attenuation of the angular correlation in an HNO$_3$ medium gave an upper limit of 10 percent attenuation with variation of the delay time from 1.85×10^{-7} to 5.5×10^{-7} sec. (auth)

3279

NEUTRON CAPTURE CROSS SECTION OF Ta^{182}. E. der Mateosian (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 1023-4(1955) Feb. 15.

The neutron capture cross section of Ta^{182} was measured by comparing the beta activity of Ta^{182} with that of Ta^{183} in a sample of tantalum irradiated in the Brookhaven National Laboratory reactor. The beta activities were compared by growing a NaI(Tl) single crystal containing in it a trace of irradiated Ta and using this crystal as a scintillation detector for its internal source. This technique, which is called "internal source spectrometry," allows one to realize a 4π solid angle geometry, ~100 percent efficiency for particles, and effectively zero source thickness, and is thus eminently suited to problems in which it is desirable to perform a comparison of the intensities of two or more beta activities over periods of time equal to weeks or months. A knowledge of the decay scheme is not necessary for this method, provided there are no "delayed" internal conversion electrons. A value of 47,000 ± 5000 barns was obtained for the capture cross section of Ta^{182} for pile neutrons. (auth)

3280

DEFINITION OF THE VIRTUAL LEVEL OF THE DEUTERON. J. Humblet (Univ. of Liege, Belgium). Phys. Rev. 97, 1145(1955) Feb. 15.

As a supplement to Ma's review article on the subject (Revs. Mod. Phys. 25, 853(1953)), the most frequently suggested definitions are discussed on the basis that nearly equal potentials should have nearly equal virtual (and resonance) levels. This point of view is in opposition to the most usual definition $\phi'(r_0,k) = 0$ and favors the Siegart (or S matrix) definition $\phi'(r_0,k) - ik\phi(r_0,k) = 0$. (auth)

3281

ENERGY LEVELS IN LIQUID He^3. O. K. Rice (Univ. of North Carolina, Chapel Hill). Phys. Rev. 97, 1176(1955) Feb. 15.

3282
MAGNETIC MOMENT OF THE 247-KEV EXCITED STATE OF THE Cd^{111} NUCLEUS. R. M. Steffen and W. Zobel (Purdue Univ., Lafayette, Ind.). Phys. Rev. 97, 1188-9(1955) Feb. 15.

3283
ON THE MASSES OF CHLORINE-39 AND ARGON-39. V. A. Kravtsov. Zhur. Ekspti'. i Teoret. Fiz. 25, No. 5, 630-2 (1953). (In Russian)

Mutually contradictory values of the $Cl^{39}-A^{39}$ mass difference have been obtained. The criterion that the resulting masses of Cl^{39} and A^{39} should lie on smooth mass surfaces through neighboring nuclides is used to reject some values. The result is $M(Cl^{39}) = 38.98016 \pm 0.00007$; $M(A^{39}) = 38.97660 \pm 0.00004$. A small but definite difference in the surfaces for even-odd and odd-even nuclei is noted. (Science Abstr.)

3284
THE THERMAL NEUTRON ABSORPTION CROSS-SECTION OF BORON. A. Green, D. J. Littler, E. E. Lockett, V. G. Small, and A. H. Spurway (Atomic Energy Research Establishment, Harwell, Berks, England) and E. Bowell. J. Nuclear Energy 1, 144-9(1954) Dec.

Measurements of the thermal neutron absorption cross section of boron made at Harwell, in Sweden, and in the U. S. A. are summarized. A new measurement made at Harwell is also described. The agreement between the Harwell and Swedish values is good, but there is still some disagreement between these and the latest American values. (auth)

NUCLEAR REACTORS

3285 BNL-322
Brookhaven National Lab.
LIQUID METAL FUEL REACTOR (LMFR) PROCESSING LOOPS. PART 1. DESIGN, CONSTRUCTION, AND CORROSION DATA. C. J. Raseman and J. Weisman, comps. June 1954. 28p.

Experiments with three liquid-metal circulation loops are described. Two of the loops were used for isothermal studies on U—Bi corrosion of stainless steel container material, together with independent evaluations of various fuel handling and instrumentation procedures. The third loop was used to determine mass transfer effects of U—Bi on stainless steel under nonisothermal conditions. The design of the three loops is described in detail, and several examples of corrosion and plugging are discussed. The performance characteristics of associated loop instrumentation are given. (auth)

3286 KAPL-1138
Knolls Atomic Power Lab.
THE EFFECT OF POSITIVE TEMPERATURE COEFFICIENTS ON REACTOR STABILITY AND REACTOR TRANSFER FUNCTION. R. Siegel and H. Hurwitz, Jr. Mar. 1, 1955. 57p. Contract W-31-109-Eng-52.

The effect on reactor stability of a prompt positive power coefficient in conjunction with a slow negative coefficient of larger magnitude is analyzed in the linear approximation. The use of the pile oscillator technique to investigate the power coefficient and, in particular, the possibility of self-sustained oscillations at higher power is discussed. (auth)

3287 KAPL-1280
Knolls Atomic Power Lab.
THE KRON ELECTRIC CIRCUIT MODEL AND ITS SOLUTION BY THE METHOD OF "TEARING" FOR A TWO-DIMENSIONAL (r,z) PROBLEM IN NEUTRON DIFFUSION. M. L. Storm. Feb. 10, 1955. 47p. Contract W-31-109-Eng-52.

The Kron electric circuit model representing the diffusion of neutrons in cylindrical (r,z) geometry is analyzed, and his method of solving the network by the process of "tearing" is illustrated by considering its application to a simple circuit model. In addition numerical results are presented for a specific problem of the diffusion of monoenergetic neutrons in a finite cylindrical reactor. The circuit model calculations were made by G. Kron by applying the method of "tearing" to a 256-junction point circuit model; the results obtained are in good agreement with the analytical solution to the problem. (auth)

3288 R53GL186
General Engineering Lab., General Electric Co.
SUBMARINE ADVANCED REACTOR GAS TURBINE CYCLE STUDY. E. A. Sheehan and A. O. White. Sept. 29, 1953. 77p. Contract [W-31-109-eng-52].

A study of several cycles for a closed cycle gas turbine power plant using He as the working fluid has been conducted for the Submarine Advanced Reactor (SAR) Project. These cycles have been compared on the basis of heat rate and He rate. The study indicates that a nuclear powered gas turbine using He as the working fluid is feasible. It appears that the best cycle of those studied for a naval power plant is the regenerative-intercooled cycle. It offers the best balance between low heat rate and He rate and weight and volume of equipment required. Using He it is necessary to operate at elevated pressure levels in order to reduce the volume flow and obtain a plant of reasonable size. (auth)

3289
REPROCESSING REACTOR FUELS. H. A. Ohlgren, J. G. Lewis, and M. Weech (Univ. of Michigan, Ann Arbor). Nucleonics 13, No. 3, 18-21(1955) Mar.

Reactor fuels must be treated after use to remove fission products, recover fissionable materials, and prepare fuel for reuse. The processing method commonly used is the solvent-extraction process which bases separation on the preferential solubilities of fission products, Pu, and U in various counterflowing organic and aqueous solutions. A typical solvent extraction process using pulse columns is described. Estimated processing costs are presented as a function of production index. Other methods for recovering reactor fuels are the BrF_3 volatility method and the pyrometallurgical process. These are described briefly. (M.P.G.)

3290
AEC INSPECTS REACTORS FOR SAFETY. Nucleonics 13, No. 3, 25-7(1955) Mar.

A standardized reactor safety inspection program has been started. All university and industrial reactors will be inspected once a year under the arrangement that now involves primarily AEC research reactors. The program requires that the inspector review reactor construction, operating procedures, uses, staff organization, and division of authority; have the staff perform reactor operating tests; review operating log and standard operating procedures; discuss with the staff the comments and recommendations planned; and submit report to AEC Director of Reactor Development. The operating tests are described, and general recommendations for safe reactor operation are listed. (M.P.G.)

3291

THE DEPRESSION OF NEUTRON FLUX BY A FOIL DETECTOR. A. De Troyer and G. C. Tavernier (Union Miniere du Haut-Katanga, Brussels, Belgium). Acad. roy. Belg. Classe sci. Mem. 39, 880-9(1953) Oct. (In English)

The depression of neutron flux in water caused by a Au detector 0.0025-cm thick and 2.5-cm diameter has been determined experimentally by two methods. The experimental result (5.2%) is found to disagree with several theories based on plain diffusion theory. Skyrme's transport theory correction is slightly larger than this result. (auth)

3292

f-CALCULATION IN HETEROGENEOUS NUCLEAR REACTORS BY MATRIX FORMALISM. P. Schmid. J. Nuclear Energy 1, 101-9(1954) Dec.

Using ordinary diffusion theory, the present work gives a universal method for calculating the thermal utilization factor f of a heterogeneous reactor with an elementary cell that contains an arbitary number of concentric cylindrical shells. Approximations for the exact matrix elements reduce the computation work considerably. An extension of this formalism, which allows for an additional cylindric-shell-shaped cooling medium with moderating properties, is given in the appendix. (auth)

3293

NUCLEAR POWER REACTORS. I. Stuart McLain (Argonne National Lab., Lemont, Ill.). Elec. Eng. 74, 44-8(1955) Jan.

Fundamental technological problems connected with the design of power reactors are illustrated with a discussion of the Argonne Research Reactor, Boiling Experimental Reactor, and the NAA Sodium Reactor Experiment programs. (K.S.)

3294

NUCLEAR POWER REACTORS. II. Stuart McLain (Argonne National Lab., Lemont, Ill.). Elec. Eng. 74, 144-8(1955) Feb.

Discussions developed in Part I are extended to the ORNL Homogeneous Reactor Test and the Argonne Experimental Breeder Reactor—II. (K.S.)

3295

NUCLEAR REACTOR CONTROL. J. M. Harrer (Argonne National Lab., Lemont, Ill.). Elec. Eng. 74, 230-3(1955) Mar.

A brief review of reactor control dynamics is presented, together with a discussion of the design of control equipment. (K.S.)

NUCLEAR TRANSFORMATION

3296 AEC-tr-2086

RECENT INVESTIGATIONS ON THE TRANSMUTATIONS OF ATOMIC NUCLEI. N. Bohr. Translated by G. Barlow and A. Bohr from Fysisk Tids. 39, 3-32(1941). 19p.

3297

SUM RULES FOR PHOTODISINTEGRATION OF THE DEUTERON. J. B. Levinger (Louisiana State Univ., Baton Rouge). Phys. Rev. 97, 970-4(1955) Feb. 15.

The experimental total cross section for photodisintegration of the deuteron is integrated numerically to 155 Mev for three moments of the curve weighting with W^{-1}, 1, and W, respectively: the bremsstrahlung-weighted cross section, the integrated cross section, and $\overline{W}\sigma_{\text{int.}}$ The integrated cross section is compared with the phenomenological sum-rule calculation, and also with the dispersion-theoretic calculation; all three values are in reasonable agreement, giving an integrated cross section about 30 percent higher than that of 30 Mev-mb for the Thomas-Reiche-Kuhn dipole sum rule. There is good agreement between the experimental value of 3.9 mb and the phenomenological calculation of 3.78 mb for the bremsstrahlung-weighted cross section. (auth)

3298

SIMPLE MODEL OF THE Li^6 NUCLEUS AND THE $Li^6(n,t)He^4$ REACTION. J. Dabrowski and J. Sawicki (Univ. of Warsaw, Poland). Phys. Rev. 97, 1002-3(1955) Feb. 15.

A model of the Li^6 nucleus consisting of an alpha particle plus a deuteron is used to calculate angular distributions of the $Li^6(n,t)He^4$ reaction for several neutron energies under the assumption that it is a pickup process. The shapes of the calculated angular distributions are similar to those of the experimental data; however, there is a lack of agreement between experiment and theory at large angles that is ascribed to compound nucleus formation. (auth)

3299

EVIDENCE FOR AN INDEPENDENT PARTICLE STATE OF C^{12} AT HIGH EXCITATION. A. K. Mann and W. E. Stephens (Univ. of Pennsylvania, Philadelphia) and D. H. Wilkinson (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 1184-5(1955) Feb. 15.

It is shown that the present evidence concerning the reaction $C^{12}(\gamma,p)B^{11}$ indicates that the "giant resonance" state at ~22-Mev excitation is of an independent-particle character and is simply related by its shell model description to the ground state of C^{12} and to the low-lying levels of B^{11}. (L.T.W.)

3300

(γ,p) AND (γ,n) YIELD RATIOS FROM SELF-CONJUGATE NUCLEI. H. Morinaga (Purdue Univ., Lafayette, Ind.). Phys. Rev. 97, 1185(1955) Feb. 15.

Proton-to-neutron yield ratios for (γ,p) and (γ,n) reactions were calculated for the nuclei C^{12}, O^{16}, Mg^{24}, Si^{28}, S^{30}, and Ca^{40}. (L.T.W.)

3301

YIELD OF PHOTOPROTONS FROM SOME LIGHT ELEMENTS. Sven A. E. Johansson (Univ. of Lund, Sweden). Phys. Rev. 97, 1186(1955) Feb. 15.

In order to obtain more experimental data on (γ,p) reactions, the proton yields for Mg, Si, S, and Cu were determined. From the yield values, the integrated (γ,p) and also (γ,n) cross sections were calculated. (L.T.W.)

3302

THE REACTION $^{25}Mg(p,\gamma)^{26}Al$. I. EXPERIMENTAL. J. C. Kluyver, C. Van der Leun, and P. M. Endt (Univ. of Utrecht, Netherlands). Physica 20, 1287-98(1954) Dec. (In English)

Energies and intensities have been measured of γ rays produced in the $Mg^{25}(p,\gamma)Al^{26}$ reaction at six resonances in the region E_p = 0.3—0.7 Mev. Thin enriched Mg^{25} targets were bombarded with protons from a Cockroft-Walton generator, and γ rays were detected with a scintillation spectrometer. The resulting pulse spectra were analyzed with a differential discriminator and photographed on an oscilloscope screen. The resonances investigated here could be assigned to Mg^{25} by comparison with runs on enriched Mg^{24} and Mg^{26} targets. The Mg^{25} resonances are found at 321, 395, 441, 501, 518, 580, 607, 667, and 688, all ± 15 kev. The 501-and 518-kev resonances could not be resolved completely, but they show almost identical γ-ray spectra. The resonances at 667 and 688 kev have not been investigated in detail. The six resonances investigated in detail show complicated γ-ray spectra, different from resonance to resonance. A list of γ-ray energies and intensities is given. From absolute γ-ray yield measurements, the radiation widths of all resonances (multiplied by a statistical factor) could be determined. (auth)

3303

THE REACTION $^{25}Mg(p,\gamma)^{26}Al$. II. CONCLUSIONS. P. M. Endt. J. C. Kluyver, and C. Van der Leun (Univ. of Utrecht, Netherlands). Physica 20, 1299-1309(1954) Dec. (In English)

The measurements described in the preceding paper are used to obtain the position, spin and isobaric spin of energy levels in Al^{26}. All the observed intensive high-energy γ rays can be explained as transitions from resonance levels to the levels found by Browne from the $Si^{28}(d,a)\ Al^{26}$ reaction and to one additional level at $E_x = 2.57 \pm 0.04$ Mev. The low-energy γ rays fit the same level scheme plus one more additional level at $E_x = 0.235 \pm 0.009$ Mev. The latter level is actually the first state in Al^{26}, which turns out to be an isomeric state decaying by β^+ emission with the long known half life of 6.6 sec. Spins J, parities and isobaric spins T can be assigned as follows: $E_x = 0$ ($J = 5^+$, $T = 0$), $E_x = 0.235$ Mev ($J = 0^+$, $T = 1$), $E_x = 0.419$ Mev ($J = 3^+$, $T = 0$), $E_x = 1.055$ Mev ($J = 1^+$, $T = 0$), $E_x = 1.750$ Mev ($J = 2^+$, $T = 0$), $E_x = 2.064$ Mev ($J = 2^+$, $T = 0$). The resonance level at $E_x = 6.73$ Mev has $J = 4^-$, $T = 0$. (auth)

3304

PROTON GROUPS FROM DEUTERON BOMBARMENT OF Ne^{20} BY MAGNETIC ANALYSIS. PART II. Katarina Ahnlund. Arkiv Fysik 9, No. 1, 39-40(1955)

An earlier report (K. Ahnlund, Arkiv Fysik 7, No. 14, 155 (1953)) described a magnetic analysis, performed at the Nobel Institute, of two proton groups of long range from the reaction $Ne^{20}(d,p)Ne^{21}$ obtained with thin separated Ne^{20} targets. They correspond to transitions to the ground state and first excited state in the nucleus Ne^{21} and had previously been analysed magnetically. The work has been extended to a search for the next two proton groups. (auth)

3305

THE DISTRIBUTION OF THE PRODUCTS OF HEAVY ION REACTIONS WITH ALUMINIUM. G. A. Chackett, K. F. Chackett, and J. H. Fremlin (Univ. of Birmingham, England). Phil. Mag. (7) 46, 1-11(1955) Jan.

The distribution in depth of the radioactive products of heavy ion bombardments of aluminium has been studied by stacked foil techniques. The bombardments were mainly done with $^{14}N^{6+}$ ions of energies up to 125 Mev, but a few were done with $^{16}O^{6+}$ ions. Some products were estimated from gross decay curves and some by radiochemical analysis. The results show that the products fall into two groups: Na^{24} together with heavier nuclei on the one hand and F^{18} together with lighter nuclei on the other. In disucssion it is shown that this can readily be explained if most products are derived from interaction of parts only of the nuclei concerned, in a way analogous to stripping reactions, rather than from breakdown of a compound nucleus. (auth)

PARTICLE ACCELERATORS

3306 CERN-55-3

European Organization for Nuclear Research,
Synchro-Cyclotron Div., Geneva
DESIGN OF CERN SYNCHRO-CYCLOTRON MAGNET.
Bengt Hedin. Jan. 14, 1955. 33p.

The procedure of design for the CERN 600-Mev cyclotron magnet is described with formulas, supported by model experiments, for calculation of fringing flux and shim shape, comparison with existing cyclotron magnets, analysis of cylindrical against tapered poles, and economical study of designs with aluminium and copper in different sizes of coils. The resulting magnet has 5-m diameter cylindrical poles and 45-cm gap, a core weight of 2500 tons, and a power demand with aluminium coils below 800 kw. (auth)

3307 AEC-tr-1953

PULSE GENERATOR OF NEUTRONS. (Generatore Impulsabile Di Neutroni). E. Gatti, G. Perona, and S. Persano. Translated from Nuovo cimento 10, 80-6(1953). 6(1953). 7p.

An abstract of this paper appears in Nuclear Science abstracts as NSA 7-2160.

3308

STANFORD HIGH-ENERGY LINEAR ELECTRON ACCELERATOR (MARK III). M. Chodorow, E. L. Ginzton, W. W. Hansen, R. L. Kyhl, R. B. Neal, and W. K. H. Panofsky. (W. W. Hansen Labs. of Physics, Stanford, Calif.). Rev. Sci. Instr. 26, 134-204(1955) Feb.

The high-energy linear electron accelerator at Stanford Univ. is a traveling-wave type operating at a wavelength of 10.5 cm. When operating in its complete form, it uses 21 klystron amplifiers, each delivering 10 to 20 Mw of power in 2-μsec pulses, repeated 60 times per second. The klystrons are distributed along the length of the 220-ft accelerator, feeding power into separate 10-ft sections. The electrons are injected at a voltage of 50 to 80 kv and travel through the accelerator wave guide which has as aperature 2 cm in diameter. Because of highly relativistic behavior, the unstable orbits do not preclude excellent beam transmission. (L.T.W.)

RADIATION ABSORPTION AND SCATTERING

3309

SCATTERING OF FAST NEUTRONS IN Pb AND Ag. T. W. Bonner, F. Alba, A. Fernandez, and M. Mazari (National Univ. of Mexico, Mexico, D. F.). Phys. Rev. 97, 985(1955) Feb. 15.

The total cross section for neutron scattering in lead and silver has been measured using monoenergetic neutrons with energies which were varied from 12.9 to 16.2 Mev. The total cross section in silver becomes smaller as the energy is increased, while the cross section in lead is greater at the higher neutron energies. In the case of lead there appears to be a broad maximum in the cross section curve at a neutron energy of 16 Mev. (auth)

3310

INTERNAL RAYLEIGH SCATTERING. A. M. Cormack (Univ. of Cape Town, Rondebosch, South Africa). Phys. Rev. 97, 986(1955) Feb. 15.

Calculations of the classical analog of the elastic (Rayleigh) scattering of γ rays by the electrons belonging to the γ-emitting nucleus have been made. The scattered radiation is a very small fraction of the unscattered radiation, and they are indistinguishable if the electron distribution is spherically symmetrical about the nucleus. (auth)

3311

STOPPING POWER OF WATER FILMS. R. Hobart Ellis, Jr., H. H. Rossi, and G. Failla (Columbia Univ., New York). Phys. Rev. 97, 1043-7(1955) Feb. 15.

By a method which has been previously used with polystyrene and acetylene, the stopping powers of water films and water vapor for low-energy alpha particles have been compared. There appears to be no anomaly, the mass stopping powers being equal to within a precision of about 5 percent. (auth)

3312

AMPLITUDES IN NUCLEON-NUCLEON SCATTERING. G. Breit and M. H. Hull, Jr. (Yale Univ., New Haven, Conn.). Phys. Rev. 97, 1047-50(1955) Feb. 15.

When scattering anomalies involving many phase shifts are to be studied, it appears desirable to treat the amplitudes directly before combining them into differential cross sections. Amplitudes suitable for the study of elastic collisions of charged and uncharged Fermi-Dirac particles of spin ½, taking account of possible identity are, therefore, given in forms convenient for computation. The case of coupling between states of the same total but different orbital angular momentum is not discussed. Formulas using the spin functions usually denoted by χ_m are supplemented by forms based on spin functions which transform like the components of an ordinary space vector, the latter allowing more compact expressions in some cases. (auth)

3313

POLARIZATION AND AMPLITUDES IN NUCLEON-NUCLEON SCATTERING. G. Breit, J. B. Ehrman, and M. H. Hull, Jr. (Yale Univ., New Haven, Conn.). Phys. Rev. 97, 1051-9(1955) Feb. 15.

The effect of coupling of states of the same J but different L on the nucleon-nucleon scattering amplitudes is investigated. Formulas for the polarization of nucleons in double scattering experiments are presented in a form suitable for numerical computation. In the derivation, special attention is given to the scattering of identical particles, and it is proved that a double scattering experiment involving identical nucleons does not require the consideration of a wave function antisymmetrized in all three-particles. The effect of the coupling on polarization is also discussed. In particular, it turns out that the nondiagonal elements of the coupling matrix give a contribution to the polarization in which the highest-order spherical harmonic drops out. (auth)

3314

THEORY OF POLARIZATION OF NUCLEONS SCATTERED ELASTICALLY BY NUCLEI. Sidney Fernbach, Warren Heckrotte, and Joseph V. Lepore (Univ. of California, Berkeley). Phys. Rev. 97, 1059-70(1955) Feb. 15.

A study of the nucleon polarization to be expected when nucleons are elastically scattered from nuclei is presented. The polarization effect is a consequence of the fact that the nucleon-nucleus interaction may be represented as a complex spin-dependent potential. The existence of such a potential is suggested by the nuclear shell model and the spin dependence of the nucleon-nucleon interaction. Qualitative arguments are advanced to determine this potential in terms of the nucleon-nucleon interaction. Although the polarization effect is by no means confined to elastic scattering, it is in this case particularly useful, since the large diffraction cross sections observed experimentally insure relatively high yields of polarized particles. A number of theoretical studies have been carried out, for both neutron and proton scattering, which show that almost full polarization can occur. The calculations have been carried out by using the W.K.B. approximation as usually applied to the nuclear optical model. The method has been checked by carrying out an exact phase shift analysis for a particular case. The results show that studies of nucleon polarization can illuminate some aspects of nuclear structure, since the polarization depends on the particular nucleus used as a target as well as upon the form of the interaction. (auth)

3315

SPECIFIC IONIZATION BY HIGH-ENERGY ELECTRONS. W. C. Barber (Stanford Univ., Calif.). Phys. Rev. 97, 1071-7(1955) Feb. 15.

The average specific ionization produced by electrons of energies ranging from 1 to 34 Mev was measured in H_2, He, and N_2 at atmospheric pressure. The measurements were made by sending a collimated beam of electrons through an ionization chamber into a Faraday cup. At minimum ionization the number of ion pairs per cm (probable specific ionization) was (7.56 ± 0.09), (6.15 ± 0.08), and (53.2 ± 0.7) at N.T.P. in the three gases, respectively. If these results are compared with the theory of energy loss, the values of W (the average number of electron volts to produce an ion pair) are calculated to be (37.8 ± 0.7), (44.5 ± 0.9), and $(34.8^{+0.9}_{-0.7})$ for the respective gases. The corresponding minimum values of the total specific ionization are calculated to be (9.19 ± 0.18), (7.55 ± 0.16), and $(61.6^{+1.2}_{-1.5})$ ion pairs per cm. The relativistic increase in ionization from minimum to 34 Mev agrees with the calculated increase in energy loss to within 1 percent for N_2, but in He and H_2 the increase in ionization is less than the predicted increase in energy loss. The effect is more certain in H_2 where an increase of about 3.3 ± 0.7 percent in W is observed. Calculations indicate that this effect may be due to the production of Čerenkov radiation which fails to produce ions in the gas. (auth)

3316

POLARIZATION IN SCATTERING BY COMPLEX NUCLEI. S. Tamor (Univ. of California, Berkeley and Livermore). Phys. Rev. 97, 1077-83(1955) Feb. 15.

Polarization effects in the elastic scattering of high-energy nucleons by complex nuclei are studied in terms of the impulse approximation. The principal aim is to reconcile the large polarizations produced by complex nuclei with the smaller effects found in nucleon-nucleon scattering. It is shown that these results are not inconsistent and can indeed be understood in terms of simple physical arguments. While, in general, our knowledge of nuclear structure is not adequate for explicit calculation of these effects even in the impulse approximation, it can be shown that for a particular class of nuclei (the deuteron and the alpha-particle nuclei) the polarization is independent of the nuclear wave function. Calculations for these nuclei have been carried out in detail, using existing nucleon-nucleon phase shifts. The resulting polarization effects are found to be large, in rough agreement with experiment, although their angular dependence is not satisfactory. It is proposed that a study of polarization in elastic scattering by deuterium and helium be used as a tool for investigation of the nucleon-nucleon interaction. (auth)

3317

RADIATIVE CORRECTIONS TO ELECTRON SCATTERING. Roger G. Newton (Institute for Advanced Study, Princeton, N. J.). Phys. Rev. 97, 1162-75(1955) Feb. 15.

The techniques and results of a previous paper are applied to the calculation of the second Born approximation of the one-photon radiative corrections to the scattering of electrons by nuclei. Nonrelativistic and high-energy approximations are calculated explicitly for pure Coulomb scattering.

Modifications due to the finite extension of the nucleus are discussed. No definite conclusion is reached concerning the change of the correction due to this extension, but it is shown that at extremely high energies the relative radiative correlation to the second Born approximation is independent of the nature of the charge distribution. It is also shown that the fictitious zeros of the first Born approximation disappear first in the third Born approximation. The shape factor occurring there is briefly discussed. (auth)

3318

ELASTIC p-p ANGULAR DISTRIBUTION 440-1000 MEV. L. W. Smith, A. W. McReynolds, and G. Snow (Brookhaven National Lab., Upton, N. Y.). Phys. Rev. 97, 1186-8(1955) Feb. 15.

Preliminary measurements of the angular distributions of elastic p-p scattering have been made at incident proton energies of 440, 590, 800, and 1000 Mev. (L.T.W.)

3319

INELASTIC NEUTRON SCATTERING IN MANGANESE. Joan M. Freeman (Atomic Energy Research Establishment, Harwell, Berks, England). Phil. Mag. (7) 46, 12-16(1955) Jan.

Gamma rays of energies 126, 853, and 980 kev have been observed following inelastic neutron scattering in Mn^{55}, with neutron bombarding energies up to 1.3 Mev. The evidence indicates levels in Mn^{55} at 126 ± 3 kev and 979 ± 8 kev, the second level decaying mainly (~95%) by cascade through the lower level. (auth)

3320

INELASTIC NEUTRON SCATTERING IN LITHIUM SEVEN. Joan M. Freeman, A. M. Lane, and B. Rose (Atomic Energy Research Establishment, Harwell, Berks, England). Phil. Mag. (7) 46, 17-30(1955) Jan.

The cross section for the reaction $Li^7(nn')Li^{7*}$, in which the residual nucleus is left in its first excited state (476 kev), has been measured as a function of neutron bombarding energy from the threshold up to 1.65 Mev. The reaction was studied by observation, with both stilbene and sodium iodide crystal detectors, of the γ rays from the Li^{7*}. Details of the experimental method are given. The shape of the excitation curve for the reaction immediately above threshold indicates a strong s-wave contribution due to a (1−) level in the Li^8 compound nucleus. Above this region the curve rises to a peak at a neutron energy of about 1.35 Mev, corresponding to a Li^8 level at 3.2 Mev ($\Gamma \simeq 1$ Mev), which can be interpreted in terms of theoretical models as either a (1+) or, possibly, a (1−) state. (auth)

3321

ELASTIC SCATTERING OF HIGH ENERGY ELECTRONS BY MERCURY. G. E. Brown (Univ. of Birmingham, England) and L. R. B. Elton (King's Coll., London). Phil. Mag. (7) 46, 164-76(1955) Feb.

Experimental results for the scattering of electrons by heavy nuclei at 126, 154 and 183 Mev are fitted with curves obtained from various assumed nuclear models by way of a phase shift analysis carried out for the case of mercury. At these energies only nuclear scattering is important and the nuclear model completely determines the scattering. Charge distributions which reproduce the experimental curves either are homogeneous or have a slight dip near the center of the nucleus and have their main decrease on the surface of the nucleus over a transition range of between 1.7 and 3.2×10^{-13} cm. The root mean square radius of the distribution is determined to be approximately $R = 1.2 \times 10^{-13} \times A^{1/3}$ cm, to a relative accuracy of about 5%. (auth)

3322

THE LARGE-ANGLE SCATTERING OF μ-MESONS IN IRON. I. B. McDiarmid (Univ. of Manchester, England). Phil. Mag. (7) 46, 177-89(1955) Feb.

The large-angle scattering of μ mesons in iron has been investigated by a method similar to that reported previously for lead. The measured large-angle distributions are compared with the theories of Molière, Olbert and a modification of Olbert's theory which is based on a single-scattering cross section inferred from recent electron-scattering measurements. At energies from several hundred Mev to about 4 bev the measured distribution, at large angles, is not consistent with present Coulomb scattering theories in which the effects of the finite nuclear dimensions are included. As in the lead experiment, the number of large angles observed is in rough agreement with Molière's theory for a 'point' nucleus. Some properties of the so-called anomalous scattering, which follow from the lead and iron experiments, are discussed. (auth)

3323

ANGULAR DISTRIBUTION OF THE REACTION (He^3,2p). M. Demeur (Univ. of Brusells, Belgium). Physica 20, 1189-99(1954) Dec. (In French)

The angular distributions of the particles emitted in (He^3, 2p), (H^3, 2n), (He^3, pn) and (H^3, pn) reactions have been calculated, supposing the occurrence of a stripping process and using the Born approximation. (auth)

3324

SOME EXPLICIT FORMULAE FOR THE ANGULAR DISTRIBUTION AND POLARIZATION OF GAMMA RADIATION EMITTED BY ORIENTED NUCLEI. Chr. D. Hartogh, H. A. Tolhoek, and S. R. de Groot (Univ. of Leiden, Netherlands). Physica 20, 1310-13(1954) Dec. (In English)

3325

ON MULTIPLE SCATTERING MEASUREMENTS IN NUCLEAR RESEARCH EMULSIONS. A. Gösta Ekspong. Arkiv Fysik 9, No. 1, 49-75(1955).

The performance of scattering measurements, various sources of error, elimination of some systematic errors, and a semi-automatic method to raise the speed of scattering determinations are described. (L.T.W.)

3326

ENERGY MEASUREMENT OF VERY SLOW NEUTRONS AFTER ELASTIC SCATTERING BY POLYCRYSTALS AND MONOCRYSTALS. Bernard Jacrot. Compt. rend. 240, 745-7(1955) Feb. 14. (In French)

Direct measurements of the neutron energy spectrum after inelastic scattering by mono- and polycrystals are reported for the range 10^{-1} to 10^{-3} ev. Polycrystalline measurements in Be, Al, Cu, and Pb and monocrystalline measurements in Cu were made. (K.S.)

3327

DETERMINATION OF MASSES OF CHARGED PARTICLES BY DEFLECTION AND RESIDUAL RANGE IN PLATES LOCATED INSIDE A WILSON CLOUD CHAMBER. M. I. Daion (Lebedev Physics Inst.). Doklady Akad. Nauk S.S.S.R. 100, 453-4(1955) Jan. 21. (In Russian)

A large Wilson cloud chamber was used to observe the deflection of μ mesons and protons in brass plates 0.2 and 0.5 cm in thickness. The known masses were calculated to within 10 to 30% by application of the multiple-scattering theory of Olbert (Phys. Rev. 87, 319(1952)) and Annis, Bridge, and Olbert (Phys. Rev. 92, 1216(1953)). (G.Y.)

RADIATION EFFECTS

3328

CHANGES IN THE ELECTRICAL PROPERTIES OF GRAPHITE DUE TO NEUTRON IRRADIATION. G. H. Kinchin (Atomic Energy Research Establishment, Harwell, Berks, England). J. Nuclear Energy 1, 124-9(1954)

The lattice defects produced to graphite by neutron irradiation give rise to additional scattering and the trapping of electrons. A simple theory is adequate to explain the changes, and both the scattering mean free path and number of electrons trapped have been calculated. (auth)

3329

A NEW INTERPRETATION OF IRRADIATION-INDUCED PHENOMENA IN ALKALI HALIDES. J. H. O. Varley (Atomic Energy Research Establishment, Harwell, Berks, England). J. Nuclear Energy 1, 130-43(1954) Dec.

Some experiments on fast electron irradiation of alkali halides are described. It is shown that a displacement collision model based on Rutherford scattering is insufficient to account for the effects noted. A mechanism is suggested whereby atomic displacements may be produced by radiation in ionic solids as a consequence of multiple ionization. The interstitial halogen atoms and metal ions thus formed can migrate under thermal activation and be captured at point vacancies in the crystal lattice. The structural complexes which may result can account satisfactorily for some of the optical absorption bands produced in alkali halide crystals as a result of x irradiation. (auth)

RADIOACTIVITY

3330 ORNL-1862

Oak Ridge National Lab.

ANGULAR CORRELATIONS IN ORBITAL CAPTURE. H. Brysk and M.E. Rose. Mar. 23, 1955. 10p. Contract W-7405-eng-26.

Angular correlations between the radiations connected with the orbital capture process exist in general. They are found not to represent at present a useful tool for the determination of nuclear parameters, however, because the selection rules enforce isotropy in most cases of interest. The conditions necessary for the observation of anisotropy (where nuclear information is available) are currently experimentally unattainable. (auth)

3331

AUGER TRANSITIONS IN Bi^{212}(ThC). Milorad Mladjenović and Hilding Slätis. Arkiv Fysik 9, No. 1, 41-7(1955).

The energies and intensities of the Auger electrons in the beta spectrum of ThB + C + C″ have been studied by means of a semicircular permanent magnet beta-ray spectrometer with photographic recording. The effective incremental charge ΔZ was calculated for different L-subshells. The values obtained were in excellent agreement with the ΔZ values for double ionized mercury measured by Bergström and Hill. The intensities of the Auger lines were compared with measurements of other authors as well as with theoretical calculations by Massey and Burhop. The fluorescence yield for the K-shell was found to be 0.96. (auth)

3332

STUDIES IN NUCLEAR SPECTROSCOPY WITH ELECTROMAGNETICALLY SEPARATED GASEOUS ISOTOPES. II. DISINTEGRATION OF SOME KRYPTON AND XENON ISOTOPES. Sigvard Thulin. Arkiv Fysik 9, No. 2, 137-95 (1955).

The present investigation deals with the decay of 9.7 hr Kr^{76}, 17.2 hr Br^{76}, 73 min Kr^{77}, 34.5 hr Kr^{79}, 4.4 hr Kr^{85m}, 9.4 yr Kr^{85}, 78 min Kr^{78}, 2.8 hr Kr^{88}, 18 min Rb^{88}, 9.2 hr Xe^{135}, 17 min Xe^{138}, and 32 min Cs^{138}. The disintegration of these isotopes has been studied by means of β and scintillation spectrometers, as well as γ-γ and β-γ coincidence spectrometers. Most of the isotopes were produced by uranium fission. Others were successfully prepared by nuclea reactions not reported before. Thus Kr^{76} was produced by Br^{79} (p,4n), Kr^{77} by Br^{79} (p,3n), and Kr^{79} by Br^{79} (d,2n) reaction. β and γ samples were prepared by means of electromagnetic isotope separation. Those decay schemes which were considered sufficiently established have been compared with level predictions of nuclear shell theory. The extreme one particle model seems not to account completel for any of the decay schemes presented. However, by applying recent extensions of the one particle model, it seems possible to account qualitatively for most level schemes. 62 references. (auth)

3333

BETA-RAY EXCITED LOW-ENERGY X-RAY SOURCES. L. Reiffel (Armour Research Foundation of the Illinois Inst. of Tech., Chicago). Nucleonics 13, No. 3, 22-4(1955) Mar.

The lack of γ emitters below 400 kev has prompted an investigation of the use of β rays to excite x-ray sources. Although radioactive sources cannot compete with electroni x-ray sources where high intensity is required, their zero power consumption, small size, portability, and long-time stability are advantageous in many applications such as radiography, thickness determinations, adsorptiometry, and x-ray fluorescence analysis. There are approximately 10 β emitters useful for the production of x rays. The mechanisms for producing x rays and the design of the sources are described. (M.P.G.)

3334

IDENTIFICATION OF Mo^{91} AND Mo^{91m}. Peter Axel, John D Fox, and Richard H. Parker (Univ. of Illinois, Urbana). Phys. Rev. 97, 975-7(1955) Feb. 15.

The known 65-second activity in Mo^{91} is shown to have an intense 650 ± 15 kev gamma ray. The 65-second activity is therefore assigned to a 650 ± 15 kev isomeric level which decays by a gamma transition 70 ± 10 percent of the time and by positron emission 30 ± 10 percent of the time. There are at least two higher-energy gamma rays with energies 1.22 ± 0.03 Mev and 1.55 ± 0.03 Mev. Existent (γ,n) and (n,2n) data are used to show that 65-sec., 650-kev Mo^{91m} is a $p_{1/2}$ state and that 15.5-min Mo^{91} is a $g_{9/2}$ state. This assignment implies that the neutron binding energy of Mo^{92} is 12.5 Mev. (auth)

3335

LEVEL SCHEME OF In^{115}. Jagdish Varma and C. E. Mandeville (Bartol Research Foundation of the Franklin Inst., Swarthmore, Penna.). Phys. Rev. 97, 977-84(1955) Feb. 15.

An abstract of this paper appears in Nuclear Science Abstracts as NSA 9-1347.

3336

DISINTEGRATION OF Te^{131}. Elizabeth Hebb (Indiana Univ., Bloomington). Phys. Rev. 97, 987-90(1955) Feb. 15.

Investigations of the nuclear radiations from the 30-hour isomeric state of Te^{131} have been made with the help of magnetic lens spectrometers and scintillation counters. Beta-ray groups of end-point energies 2.46, 2.14, 1.69, 1.35, 0.98, 0.57, and 0.42 Mev have been found. The well known internally converted 0.180-Mev transition, that from the 30-hour isomeric state of Te^{131} to the 25-minute ground state, was reinvestigated, and its K/(L + M) ratio of 2.4 corresponds to that of an M4 transition. Photoelectron spectra show well defined lines corresponding to gamma-ray energies of 0.773, 0.446, 0.331, 0.147, and 1.12 Mev, and weaker lines corresponding to gamma-ray energies of 0.24, 0.275, 0.575, 0.84, and 1.63 Mev. Gray wedge pictures of NaI(Tl) scintillation spectra indicate that the 0.147 and 0.446-Mev transitions are the main lines appearing in the 25-minute tellurium with the 0.773-Mev line also visible. Gamma-gamma scintillation coincidence experiments on the long-lived tellurium are utilized in establishing a possible decay scheme. (auth)

3337

GAMOW-TELLER INTERACTION IN THE DECAY OF He^6. B. M. Rustad and S. L. Ruby (Brookhaven National Lab., Upton, N. Y. and Columbia Univ., New York). Phys. Rev. 97, 991-1002(1955) Feb. 15.

The coefficient α in the electron-neutrino angular correlation $W(\phi) = [1 + \alpha(p/W)_{\cos\phi}]$ for the He^6-Li^6 transition has been determined by measuring the coincidence rate between recoil ions and beta rays of selected energy as a function of the angle between the particles. Since the decay of He^6 (allowed ft value and $\Delta I = 1$) obeys only Gamow-Teller selection rules, the interaction Hamiltonian for this transition is specified completely by $(G_A A + G_T T)$. The measured values of the correlation coefficient are $\alpha_{1.25} = +0.36 \pm 0.11$ for beta rays with mean energy 1.25 Mev and $\alpha_{2.0} = +0.31 \pm 0.14$ for the mean energy 2.0 Mev. These results are compared with $\alpha_T = +\frac{1}{3}$ and $\alpha_A = -\frac{1}{3}$ predicted from the pure tensor and axial vector invariants, respectively. The limiting value set by the experiment for (G_A/G_T) together with the observed absence of the Fierz interference terms for allowed beta spectra proves that the tensor invariant is dominant in the beta-decay interaction of He^6. (auth)

3338

DECAYS OF Ta^{182} AND Ta^{183}. J. J. Murray, F. Boehm, P. Marmier, and J. W. M. DuMond (California Inst. of Tech., Pasadena). Phys. Rev. 97, 1007-16(1955) Feb. 15.

The β^- decays of Ta^{182} and Ta^{183} into excited states of W^{182} and W^{183} have been studied using a curved crystal gamma-ray diffraction spectrometer and a homogeneous field, ring focusing beta-ray spectrometer. In each case de-excitation of the daughter nucleus gives rise to complex gamma-ray and conversion electron spectra. Energies and relative intensities of gamma rays and conversion lines arising from 27 transitions in W^{182} and 29 transitions in W^{183} are presented. Internal conversion coefficients and multipolarities have been deduced for most of the transitions and together with the gamma-ray energies form the basis of decay schemes proposed for both W^{182} and W^{183}. The two decays are reported together because of the close experimental relationship which existed between them as a consequence of the method used for their production, namely, simultaneous production of Ta^{182} by single neutron capture and Ta^{183} by double neutron capture from stable Ta^{181}. A corollary result is the value 1.3×10^4 barns for the thermal neutron cross section of Ta^{182}. An interpretation of these results on W^{182} in terms of collective rotational motion has been given by A. Bohr and collaborators [Kgl. Danske Videnscab. Selskab, Mat.-fys. Medd. 29, No. 9, (1955)]. (auth)

3339

RADIATIONS FROM CERIUM-141. James T. Jones, Jr., and E. N. Jensen (Iowa State Coll., Ames). Phys. Rev. 97, 1031-3(1955) Feb. 15.

The beta spectrum of Ce^{141} has been examined with an intermediate-image spectrometer adapted for coincidence measurements. The beta decay was found to be complex with two beta groups of maximal energies 574 ± 3 kev and 432 ± 2 kev. The data obtained indicated the presence of a single gamma ray, with an energy of 144.9 ± 0.7 kev. Coincidence measurements inferred that the gamma ray was in coincidence with the lower-energy beta group. Gamma-ray spectra obtained with a scintillation spectrometer and a thin-lens spectrometer indicated that only one gamma ray is present in Ce^{141}. Transitions ascribed to higher-and lower-energy beta groups are $\Delta I = -1$, "yes" and $\Delta I = 0$, "yes," respectively. The gamma ray is probably magnetic dipole radiation. An $f_{7/2}$ state, with odd parity, is assigned to the ground state of Ce^{141}; a $g_{7/2}$ state, with even parity, is assigned to the first excited state of Pr^{141}. (auth)

3340

DISINTEGRATION OF As^{71}. William E. Graves and Allan C. G. Mitchell (Indiana Univ., Bloomington). Phys. Rev. 97, 1033-6(1955) Feb. 15.

The disintegration of As^{71}, formed by the deuteron bombardment of separated Ge^{70}, has been investigated with the help of magnetic spectrometers, scintillation spectrometers, and coincidence counting. The half life was found to be 62 ± 3 hours. Two gamma rays are emitted whose energies are 175.0 ± 0.3 kev and 23 kev. Positrons are emitted which have an end-point energy of 815 ± 10 kev. The state at 175 kev has a half life of 0.07×10^{-6} sec. A tentative decay scheme is proposed. (auth)

3341

THE DECAY OF ^{90}Nb. Ong Ping Hok, P. Kramer, and G. Meijer (Univ. of Amsterdam, Netherlands). Physica 20, 1200-8(1954) Dec. (In English)

Measurements have been performed on the radiations of Nb^{90} with a double-focusing spectrometer and with a scintillation spectrometer. The position spectrum consists of three partial spectra with maximum energies of 1,500, 0.865, and 0.55 Mev. Seven γ transitions have been deduced from the conversion electrons and the γ scintillation spectrometer measurements. Together with the results of β-e^--coincidence measurements, a probable decay scheme has been constructed. (auth)

3342

RADIOACTIVE DECAY OF ^{103}Ru. B. De Raad, W. C. Middelkoop, B. Van Nooyen, and P. M. Endt (Technische Hogeschool, Delft, Netherlands). Physica 20, 1278-86(1954) Dec. (In English)

The decay of ^{103}Ru has been investigated with a scintillation spectrometer, a β-ray lens spectrometer, and by β-γ absorption coincidence measurements. With the scintillation spectrometer the x ray and two strong γ rays were found with the following energies and relative intensities: 20 kev (9.1%), 498 kev (100%), and 611 kev (7.8%). In addition three very weak γ rays were observed at 53 kev (0.4%, 295 kev (0.4%), and 357 kev (0.25%). With the β-ray spectrometer the K conversion coefficient of the 611-kev γ ray was found as (0.06 + 0.02)%, which characterizes this transition as E1. Also the intensity of the weak β component with an endpoint of 702 kev was measured as 2.9%. Absorption measurements of the β particles in coincidence with the 611-kev γ ray show that there exists a third β ray branch with an endpoint of 145 ± 35 kev, in addition to the known β ray branches with endpoints of 217 and 702 kev. No coincidences were found between the 702-kev β-ray branch and the 53 kev-γ ray, showing that the half life of the 53-kev level is greater than 10 μsec. The Rh^{103} level scheme deduced from these measurements is in agreement with that given by Cork et al., except for the spin of the 611-kev level and of Ru^{103}. There are strong arguments that both are $J = \frac{1}{2}^+$. Also the levels found from Coulomb excitation by Heydenburg and Temmer at 295 kev ($J = 3/2^-$) and 357 kev ($J = 5/2^-$) have been confirmed from the Ru^{103} decay. (auth)

3343

ON THE MASSES OF SCANDIUM-48 AND VANDIUM-48. V. A. Kravtsov and I. Kh. Lemberg. Zhur. Eksptl'. i Teoret. Fiz. 25, No. 5, 628-30(1953). (In Russian)

The difficulties associated with the absence of the β-decay $Ca^{48} \rightarrow Sc^{48}$ and the allowed character of the $Sc^{48} \rightarrow Ti^{48}$ decay can both be removed by assuming that the latter proceeds to the 3rd (not 2nd) excited state of Ti^{48} and is followed by a cascade $\gamma_1 = 1.33$, $\gamma_2 = 0.98$, $\gamma_3 = 0.98 \pm 0.05$ Mev. The deduced mass of Sc^{48} is 47.96741 ± 0.00009 which then fits smoothly the mass surface for even-even nuclei. (Science Abstr.)

RARE EARTHS AND RARE-EARTH COMPOUNDS

3344

NEUTRON DIFFRACTION BY METALLIC ERBIUM. W. C. Koehler and E. O. Wollan (Oak Ridge National Lab., Tenn.) Phys. Rev. 97, 1177-8(1955) Feb. 15.

Neutron diffraction studies were made on erbium from room temperature to 4.2°K. At room temperature the neutron pattern is characteristic of a paramagnetic material. The full L and S contribution from the eleven 4f electrons is indicated. The coherent nuclear reflections can be interpreted in terms of a simple hexagonal close-packed structure. Below ~ 80°K some additional coherent reflections are observed which are believed to be of magnetic origin. Reasons for this belief are outlined. At 4.2°K the magnetic reflections, disregarding a small contribution from the high-temperature phase, are those characteristic of a ferromagnetic substance with the simple hexagonal close-packed structure and for which the moments are directed parallel to the hexagonal axis. (L.T.W.)

SHIELDING

3345 AMRL-138

Army Medical Research Lab., Fort Knox

A SAFETY INTERLOCKING DEVICE FOR STABILIZING RADIATION SHIELDING WALLS. Ray R. Heer, Jr. Feb. 10, 1954. 9p. (AD-44668)

An interlocking device for mechanically stabilizing multi-thickness multi-tiered lead brick walls is described. The device consists of a flat steel plate $\frac{1}{8}'' \times \frac{1}{2}'' \times \frac{3}{16}''$ with two $1\frac{11}{16}''$ steel rods press-fitted into the plate. These rods fit into holes which are drilled in the bricks, the holes being placed in such a way that the device does not appreciably reduce the radiation protection ability of the wall. All popular type bricks are easily adapted to the device. (auth)

SPECTROSCOPY

3346

MASS CORRECTIONS TO THE HYPERFINE STRUCTURE IN HYDROGEN. W. A. Newcomb (Forrestal Research Center, Princeton, N. J.) and E. E. Salpeter (Cornell Univ., Ithaca, N. Y.). Phys. Rev. 97, 1146-58(1955) Feb. 15.

In a previous paper, a covariant wave equation for bound states was used to calculate corrections to fine structure. The techniques developed in that paper are extended here to the study of hyperfine structure (hfs) in the hydrogen atom. An expression is derived for corrections of relative order ($\alpha m/M$) to the hfs splitting of any S-state of hydrogen, arising from the finite mass of the nucleus. The proton is considered as a point particle with an anomalous magnetic moment of the Pauli type in addition to its Dirac moment. It is shown that the corrections obtained with an unmodified Pauli moment diverge logarithmically, and a cut-off in momentum space is introduced. Numerical results are given for the limit of large cut-off momentum. It is shown that the leading terms, which involve $\log(M/m)$ as a factor, can also be obtained from a modified form of three-dimensional perturbation theory. (auth)

3347

MICROWAVE SPECTROSCOPY OF GASES. J. Sheridan (Univ. of Birmingham, England). Research (London) 8, 88-93(1955) Mar.

Significant advances in the field of microwave spectroscopy during the last 4 years are reviewed. Experimental methods are described. Information obtained from microwave spectroscopy, such as internuclear distances, molecular and nuclear properties, and collision processes between molecules, is briefly summarized. 82 references. (M.P.G.)

THEORETICAL PHYSICS

3348

NUCLEON ANOMALOUS MOMENT IN A CUT-OFF MESON THEORY. M. H. Friedman (Univ. of Illinois, Urbana). Phys. Rev. 97, 1123-5(1955) Feb. 15.

The anomalous magnetic moments of the neutron and proton are calculated to fourth order by using a cut-off meson theory. The value obtained is 1.44 when one uses the same parameters as employed for fitting the meson-nucleon scattering data. (auth)

3349

VARIABLE MASS EQUATIONS. J. E. Meggitt (Emmanuel Coll., Cambridge, England). Phys. Rev. 97, 1126-31(1955) Feb. 15.

Isotopic spin-space is generalized. The equations of field theory then describe systems of interacting particles as in ordinary isotopic spin-theory, but the particles and their interactions are more complex. The different systems which arise from different generalizations are systematically discussed. (auth)

3350

PROPER-TIME ELECTRON FORMALISM. William C. Davidon (Univ. of Chicago). Phys. Rev. 97, 1131-8(1955) Feb. 15.

A classical and first quantized formalism is presented which gives a complete description of electrons in a given electromagnetic field, including real and virtual pair processes. The Feynman viewpoint of electrons propagating through space-time is adopted throughout. Interactions between electrons are considered only in the classical theory, and a nonlocal interaction is assumed to make all effects finite. Consideration of interactions in the quantized theory is reserved to field quantization, which will be presented in a following paper. The calculation of transition probabilities gives the results of hole theory as interpreted by Feynman. (auth)

3351

PARTICLES WITH SPIN TWO. Adel da Silveira (Colegio Pedro II, Rio de Janeiro, Brazil). Phys. Rev. 97, 1144(1955) Feb. 15.

The possibility of obtaining an equation for particles with spin 2 without the introduction of an additional field is considered. The equation and the supplementary conditions are reduced to those proposed by Pauli and Fierz for the free particle. (auth)

URANIUM AND URANIUM COMPOUNDS

3352

ON THE PROPERTIES OF THE URANIUM SULFIDES U_3S_5 AND U_2S_3. Marius Picon and Jean Flahaut. Compt. rend. 240, 784-5(1955) Feb. 14. (In French)

3353

PSEUDO-BINARY PHASE SECTIONS BETWEEN LAVES PHASES IN TERNARY ALLOYS OF URANIUM. G. B. Brook, G. I. Williams, and E. M. Smith (Fulmer Research Inst., Stoke Poges, Bucks, England). J. Inst. Metals 83, 271-6 (1955) Feb.

The phase boundaries at 700° and 900°C have been determined in the pseudo-binary systems UMn_2-UNi_2, UFe_2-UNi_2, and UCo_2-UNi_2. The C15 structures of UMn_2, UFe_2, and UCo_2 are progressively replaced first by an intermediate hexagonal C36 structure and then by the hexagonal C14 structures, become rather more restricted on passing from manganese to iron to cobalt. Conversely, the range of the intermediate solution with the C36 structure is widened on passing from manganese to iron to cobalt. The phase boundaries differ only slightly at 700°C. It is concluded that the positions of the phase boundaries in these sections cannot be explained by simple considerations of either size-factor relationships or the electron: atom ratios, regarded separately. (auth)

3354

THE CONSTITUTION OF URANIUM–ZIRCONIUM ALLOYS. D. Summers-Smith (Imperial Chemical Industries, Ltd., London). J. Inst. Metals 83, 277-82(1955) Feb.

The uranium–zirconium system has been examined by metallographic, dilatometric, and x-ray methods, using alloys prepared by arc melting. A continuous series of body-centerd cubic solid solutions is formed between γ uranium and β zirconium. At 14.5 at.% zirconium the γ phase exists up to 693° ± 3°C, where it undergoes a monotectoid reaction; at 69.5 at. % zirconium it exists up to 606° ± 3°C, where it transforms by a eutectoid reaction. A miscibility gap is formed at 693°C from 14.5 to about 57 at. % zirconium; this reaches a maximum at 740° ± 5°C, and 34 at. % zirconium. The maximum solubility of zirconium in β uranium is 2.5 at. % at 693°C; the β solution transforms by a eutectoid reaction at 662° ± 2°C, 1.5 at. % zirconium. The maximum solubility of zirconium in α uranium at the eutectoid is placed tentatively at about 1 at. %; the eutectoid transformation extends to approximately 61 at. % zirconium. The solubility of uranium in α zirconium is estimated to be 0.75 at. % at 606°C. It was not found possible to completely retain the γ solution by quenching either lumps or powders containing up to 35 at. % zirconium. It was retained completely, however, in the 40 at. % zirconium alloy. The β uranium solution containing 2.5 at. % zirconium could not be retained by quenching. (auth)

3355

ENERGY DEPENDENCE OF THE U^{235} FISSION CROSS-SECTION. Dragoslav Popović and Nenad Rajšić (Joint Establishment for Nuclear Energy Research, Kjeller, Norway). J. Nuclear Energy 1, 170(1954) Dec. (cf. NSA 9-1145)

The measurements of the fission cross section U^{235} as a function of neutron energy (J. Nuclear Energy 1, No. 1, 3-4 (1954)) have been extended up to 0.4 ev, and a fission resonance at about 0.26 ev was found. In this paper the whole curve σ_{fiss}/σ_B vs. energy is given. (auth)